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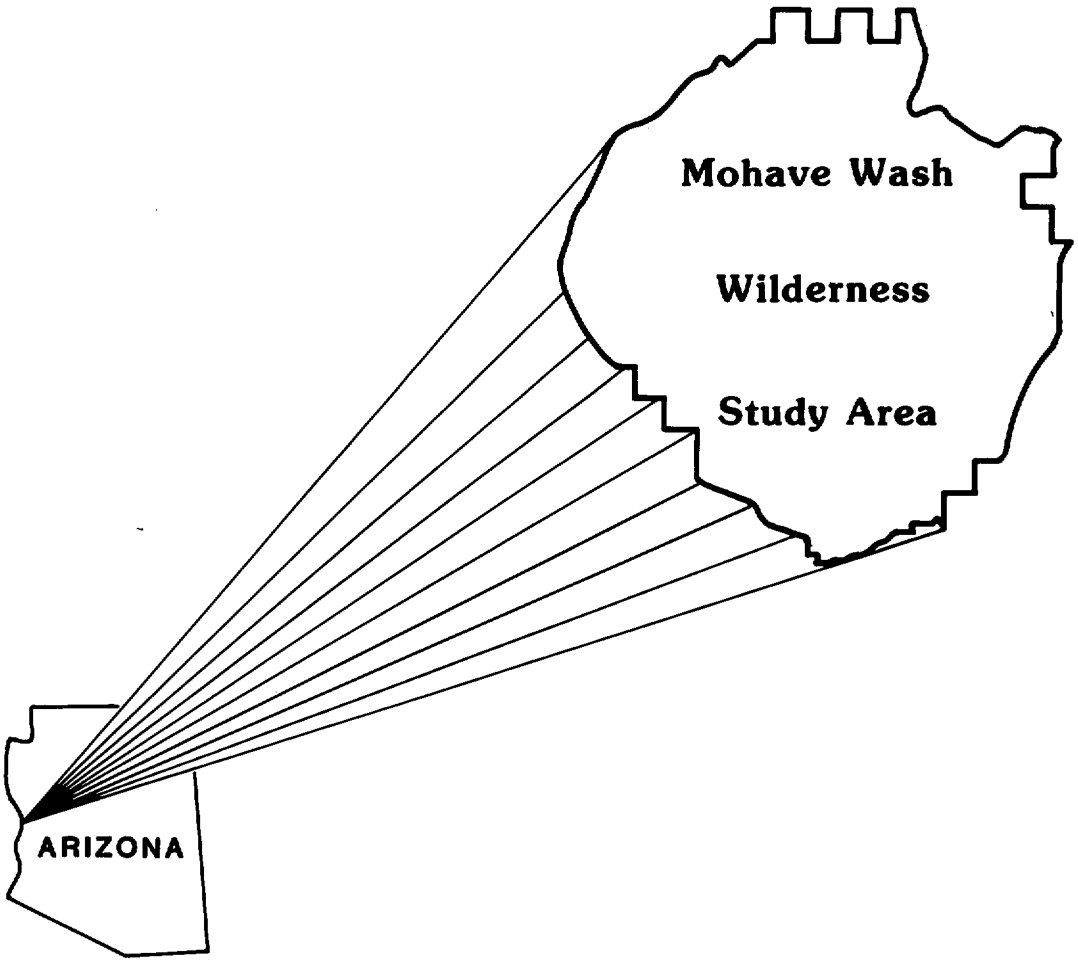
Mineral Land Assessment
Open File Report/1989

Mineral Resources of the Mohave Wash Wilderness Study Area (AZ-050-007C/048/020-052), Mohave County, Arizona



BUREAU OF MINES
UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL RESOURCES OF THE MOHAVE WASH WILDERNESS STUDY AREA (AZ-050-007C/048/ 020-052), MOHAVE COUNTY, ARIZONA

by

John R. McDonnell, Jr.

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1989

Intermountain Field Operations Center
Denver, Colorado

UNITED STATES DEPARTMENT OF THE INTERIOR
Manuel Lujan, Jr., Secretary

BUREAU OF MINES
T S Ary, Director

PREFACE

The Federal Land Policy and Management Act of 1976 (Public Law 94-579) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Mohave Wash Wilderness Study Area (AZ-050-007C/048 020-052), Mohave County, Arizona.

This open-file report summarizes the results of a Bureau of Mines wilderness study. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. This study was conducted by personnel from the Resource Evaluation Branch, Intermountain Field Operations Center, P.O. Box 25086, Denver Federal Center, Denver, CO 80225.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

o	degree	%	percent
ft	foot	lb	pound
in.	inch	mi^2	square mile
ppb	part per billion	oz/st	troy ounce per short ton (2,000 lb)
ppm	part per million		

MINERAL RESOURCES OF THE MOHAVE WASH WILDERNESS STUDY AREA (AZ-050-007C/048/ 020-052), MOHAVE COUNTY, ARIZONA

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SUMMARY

The Mohave Wash Wilderness Study Area comprises 104,605 acres in Mohave County, Arizona. In 1987, the Bureau of Mines conducted a mineral investigation of the study area as requested by the Bureau of Land Management and authorized by the Federal Land Policy and Management Act of 1976 (Public Law 94-579). In April 1988, the area was recommended nonsuitable for wilderness by the Bureau of Land Management, due in part to land status problems and the identification of mineral resources by the Bureau of Mines. This report presents the results of the Bureau's investigation. The Bureau reviewed and assembled literature related to mineral resources and mining activity, and conducted a field examination of mines, prospects, and mineral occurrences inside and near the study area.

The Paloma mining district covers about 15 mi^2 in the south-central part of the study area and contains numerous quartz veins. Field observations and sample analyses indicate that some of the veins are gold-bearing and that gold resources are likely to exist throughout the district. Two mineralized veins had sufficient gold content and continuous extent to estimate resources; one contains 1,000 short tons of indicated resources averaging 0.06 ounces of gold per short ton and the other contains 250 short tons of indicated and 300 short tons of inferred resources averaging 0.16 ounces of gold per short ton. The low resource value of each vein ($16,000-$35,000 at $400 per ounce of gold) would make commercial extraction subeconomic and any future mine development would probably be limited to individual small-scale operations.

An unpublished Arizona Department of Mineral Resources report and the presence of lode gold indicate that a placer gold deposit is likely to exist in drainages in the Paloma district. Information supplied by claimants shows prospecting results favorable for the occurrence of placer gold along the eastern flank of the study area, and Bureau analytical data suggest placer gold could occur along the eastern and western flanks.

Perlite occurs in the northeastern part of the study area and tests of a sample showed that the material was suitable for use in some expanded perlite end-products. The low quality, remoteness, and small exposure size, however, make the perlite not commercially competitive and it is not considered a resource.

Sand and gravel occurs in drainages and low-lying areas throughout the study area. A study in 1986-87 by the Arizona Department of Transportation concluded that material adjacent to the northwestern study area boundary is moderate road gravel quality and may be used for future highway rebuilding. Resources of sand and gravel of similar quality are likely to be present inside the study area, but sufficient material exists outside to meet current and near future needs.

As of 1987, Bureau of Land Management files show a checkerboard-like covering of the study area by oil and gas leases. No oil and gas discoveries or shows have been reported in the area, and an evaluation by the U.S. Geological Survey rated the study area as having "low to zero" potential.

INTRODUCTION

In February, March, and September 1987, the Bureau of Mines, in cooperation with the U.S. Geological Survey (USGS), conducted a mineral investigation of the Mohave Wash Wilderness Study Area (WSA), Mohave County, Arizona. The WSA comprises 104,605 acres of public land managed by the Bureau of Land Management (BLM) Yuma District Office. In April 1988, the BLM changed the status of the study area to nonsuitable for wilderness, due in part to land status problems and the identification of mineral resources by the Bureau of Mines. The USGS and Bureau of Mines completed their studies in order to provide minerals information necessary to the Congressional wilderness process.

The Bureau surveyed and studied mines, prospects, and mineral occurrences to appraise reserves and identified subeconomic resources. The USGS assesses the potential for undiscovered mineral resources based on regional geological, geochemical, and geophysical surveys. This report presents the results of the Bureau's study, which was completed prior to the USGS assessment. The USGS will open file the results of their studies separately. A joint USGS-Bureau report, to be published by the USGS, will integrate and summarize the results of both studies.

Location and access

The WSA is in west-central Arizona, about 11 mi east to southeast of Lake Havasu City (fig. 1). The area boundary is irregular, commonly following improved and unimproved roadways, and section lines. About 17 sections in the interior of the study area are excluded from wilderness consideration because of railroad- and state-grant inholdings (pl. 1).

Primary access is from the west by the unimproved Dutch Flat Road, which exits State Highway 95 about 10 mi southeast of Lake Havasu City and follows Standard Wash. Nonmaintained roads in washes, and four-wheel-drive (jeep) and foot trails provide access within the WSA.

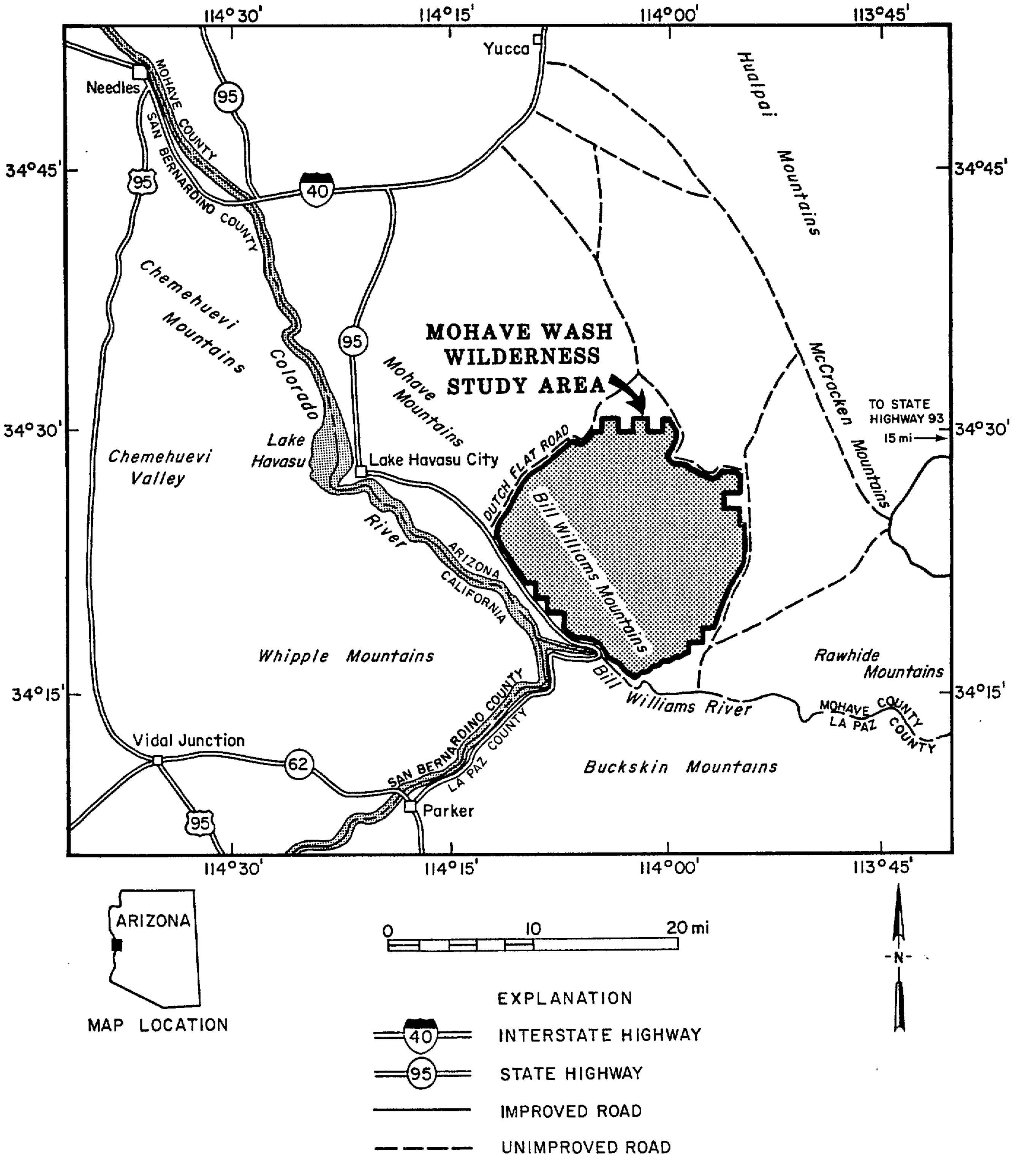

Figure 1.--Index map of the Mohave Wash Wilderness Study Area, Mohave County, Arizona.

Previous studies

Since the late 1970's, the region that includes the WSA has been the subject of numerous private, State, and Federal mineral related studies, conferences, and publications. A majority of the work was directed toward mineralization related to metamorphic core complexes and low-angle (detachment) faults. Much of the pre-1982 information was summarized and discussed in "Mesozoic-Cenozoic Tectonic Evolution of the Colorado River Region, California, Arizona, and Nevada" (Frost and Martin, 1982), which was published in conjunction with a symposium and field trips for the Geological Society of America. A more recent digest, "Frontiers in Geology and Ore Deposits of Arizona and the Southwest" (Beatty and Wilkinson, 1986), presented the proceedings of a symposium sponsored by the Arizona Geological Society, and updates and compliments some of the earlier information.

Mineral resource investigations of the Crossman Peak (Light and others, 1983; Light and McDonnell, 1983; 1987), and Aubrey Peak (Lane, 1988) WSA's, which respectively are near the northwestern and eastern sides of the Mohave Wash study area, were completed by the USGS and Bureau of Mines.

Methods of investigation

Background research included a review of literature related to the mineral resources and mining activity in and near the WSA. Mining claim information and land status records were obtained from the BLM State Office in Phoenix, Arizona. Minerals information and production data were assembled from Bureau files and other sources.

Four Bureau geologists spent 38 field-days examining mines, prospects, and mineral occurrences inside and near the WSA. The field work included examinations using helicopter, four-wheel-drive vehicle, and foot traverses of the area. Mining claim locations and mineral occurrences were examined, and workings within the study area were surveyed by tape-and-compass method, mapped, and sampled.

A total of 188 samples was collected from workings and mineralized areas. Samples were analyzed for 34 elements[1/] by induced neutron activation and for bismuth, copper, lead, molybdenum, manganese, and silver by D. C. plasma emission spectrometry. Selected samples were also analyzed for gold by fire assay, mercury by cold vapor atomic absorption, and barium by X-ray fluorescence. Analyses were performed by Bondar-Clegg, Inc., Lakewood, Colorado. One sample was taken from a perlite outcrop and was tested for quality by The Perlite Corp., Chester, Pennsylvania. Sample data are summarized in this report and complete sample data are available for public inspection at the Bureau of Mines, Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, Colorado.

Acknowledgments

Appreciation is extended to claimants Milton Fuller, S. Everett Ashcraft, and D. E. and Elizabeth Row for prospecting and sampling information, and to R. W. Krohn, Arizona Department of Transportation for furnishing information concerning the sand and gravel evaluation in Standard Wash adjacent to the WSA.

Geographic and geologic setting

The Mohave Wash WSA is in the Sonoran Desert section of the Basin and Range physiographic province. Terrain consists of the rugged Bill Williams Mountains, flanking bajadas, and dissecting alluviated washes, which are as

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1/ Ag, As, Au, Ba, Br, Cd, Ce, Co, Cr, Cs, Eu, Fe, Hf, Ir, La, Lu, Mo, Na, Ni, Rb, Sb, Sc, Se, Sm, Sn, Ta, Tb, Te, Th, U, W, Yb, Zn, and Zr.

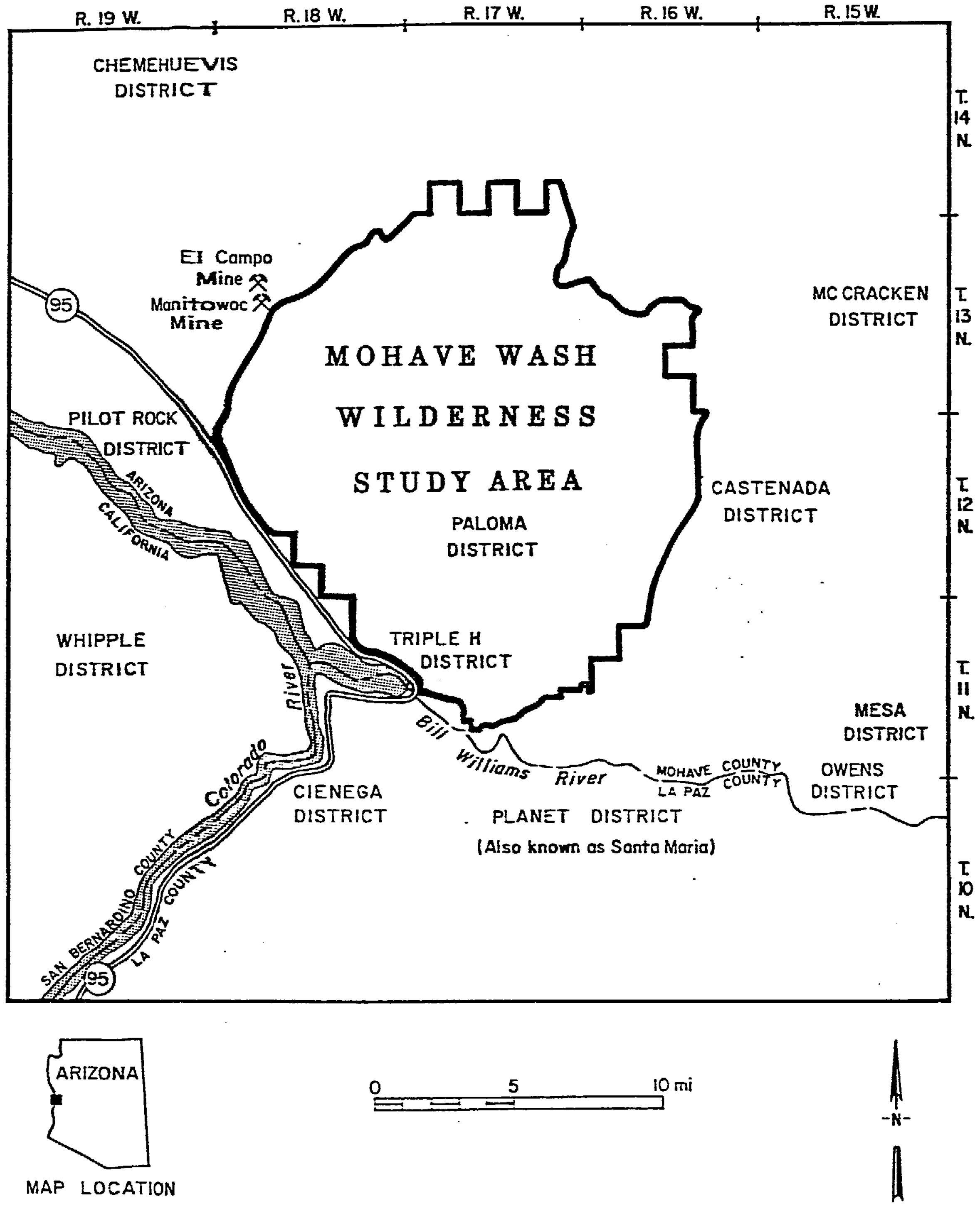
wide as 1/2 mi. Elevations range from about 460 ft along the Bill Williams River at the southern end of the study area to 2,960 ft on Black Mountain at the northern end.

Rocks in the area consist mainly of Precambrian-age gneiss and schist that have been intruded by Cretaceous(?)-age diorite and granodiorite. The Precambrian and Cretaceous rocks were subsequently intruded by Tertiary-age dikes and are overlain nonconformably by Tertiary volcanic and sedimentary strata. Quaternary-age, poorly sorted, unconsolidated fanglomerates and fluvial sands and gravels cover the flanks of exposed older rocks and fill washes. (See Howard and others, 1982; and Pike and Hansen, 1982.)

The area is structurally complex and lies within a terrane characterized by Tertiary low-angle normal (detachment) faults. Detachment faults have been mapped to the southeast in the Rawhide-Buckskin Mountains, to the southwest in the Whipple Mountains, and to the northwest in the Chemehuevi Mountains. No detachment faults have been mapped in the study area, but Howard and others (1982, p. 378) projected the Whipple Mountains detachment fault beneath the range that includes the study area. High-angle faults in the study area are believed to be related to the detachment fault displacement. (See Howard and others, 1982.)

MINING HISTORY

Prospecting and mining have taken place intermittently in the vicinity of the WSA since the 1860's. There are, however, no formal mining districts or recorded production from inside the area. Figure 2 shows the locality of, and production data for, mining and mineral districts in the vicinity. The Paloma and Triple H districts are shown in the WSA, but respectively are a locally established name and a reported mineral occurrence, neither of which has had recorded production.



PRODUCTION DATA FOR MINING AND METALLIC MINERAL DISTRICTS IN AND NEAR THE MOHAVE WASH WILDERNESS STUDY AREA.
[—-, unknown. Data compiled from Ariz. BuMines, 1969; Keith, 1978; Keith and others, 1983; Moyle and Gabby, 1985; Ridenour and others, 1982b; and Wodzicki and others, 1982.]

Mining or mineral district	Year(s)	Ore tonnage (st)	Commodity: Copper (lb)	Commodity: Gold (oz)	Commodity: Lead (lb)	Commodity: Manganese (lb)	Commodity: Silver (oz)	Notes/description
Castenada	—	11	—	—	—	(minor)	—	Manganese occurs in beds and fracture zones in sandstone in the Artillery Formation or similar strata.
Chemehuevis	1913-1958	1,500	500	1,000	27,000	—	3,000	Minerals in stringers, pods, and lenses in gneiss and schist near granite and dikes. Also produced: 148 st units tungsten and minor placer gold.
Cienega	1870-1974	19,000	1,834,000	12,000	288	—	3,364	Minerals occur as replacement bodies associated with faults, fractures, and shear zones in metamorphosed limestones, shales, and quartzites. Also minor placer gold production.
McCracken	1911-1981	173,000	10,000	100	3,031,000	—	699,000	Minerals occur in fissure veins in diorite and pegmatite. Also produced: zinc, 43,000 lb; molybdenum, 100 lb.
Mesa	—	330	—	—	—	40,000 to 80,000.	—	Minerals occur in pods, seams, and veinlets in a shear zone and in limestone, sandstone, and basalt.
Owens (Includes Silver Streak Mine.)	1921-1956	800	3,000	100	63,000	—	10,000	Minerals occur in fissure veins in a complex of schistose diorite and pegmatite.
Paloma	—	—	—	—	—	—	—	Gold, silver, and copper minerals occur in fissure veins in gneiss.
Pilot Rock	—	—	—	—	—	(minor)	—	Manganese occurs in small en echelon fractures in veins and faults in basalt and sandstone near granite.
Planet (Also known as Santa Maria.)	1862-1974	1,405,000	45,350,000	1,128	—	237,500	24,606	Minerals occur in small, irregular replacement bodies and veins along fault zones in carbonate rocks and gneiss. Also minor placer gold and silver production.
Triple H	—	—	—	—	—	—	—	Uranium occurrence(?).
Whipple (Includes Copper Basin Mine, 1930-1966.)	1906-1969	5,563	223,993	1,334	1,192	2,500	9,482	Minerals occur along hydrothermally altered low-angle fault system.

Figure 2.--Mining and mineral districts in and near the Mohave Wash Wilderness Study Area, Mohave County, Arizona.

As shown in figure 2, copper, gold, lead, manganese, and silver are the primary metals produced from districts in the vicinity. The mineralization mainly occurred in veins or as replacement deposits associated with fault and fracture zones that have been attributed to regional tectonic activity. Mineral deposits in the Whipple and Buckskin Mountains have been related to detachment faulting. These deposits are the result of mineralizing fluids moving along fault conduits and brecciated zones serving as sites for deposition of the metals and gangue minerals. (See Lehman and others, 1987; Ridenour and others, 1982a; and Wilkins and Heidrick, 1982.)

The Manitowoc and El Campo Mines are just outside the northwestern WSA boundary (fig. 2). The Manitowoc Mine comprises three lode claims that were patented in 1910, but no production records were found. The main workings are inaccessible and the type of mineral occurrence is uncertain, but field observations suggest mineralized quartz veins. Light and McDonnell (1983, p. 96) reported that silver and gold, with minor lead and zinc were probably the metals recovered. The El Campo Mine was worked as a placer gold deposit during the 1930's. The workings were cut on a contact between a pebble conglomerate and Precambrian granodiorite in a paleochannel. No production is known, but Light and McDonnell (1983, p. 95) suggest some gold flakes and small nuggets may have been recovered. Field observations at the two mines revealed no evidence that the mineralized structures can be projected into the WSA.

Plate 1 shows the unpatented placer and lode mining claims that are located in the study area. No active mining operations were observed during the Bureau's field investigation, but Bureau data and correspondence with claimants indicate that prospecting and near-surface exploration (chiefly for gold) have been prevalent and are continuing in the WSA.

OIL AND GAS

No oil and gas discoveries or shows have been reported in or near the WSA, even though BLM files (as of 1987) show a checkerboard-like covering of the study area by oil and gas leases (fig. 3). The leasing was probably a response to speculation that the Idaho-Wyoming overthrust belt may extend into Arizona.

Ryder (1983) evaluated the petroleum potential of wilderness lands in Arizona on the basis of structural and petroleum geology derived from published literature. His evaluation (1983, p. C19) included the study area in a zone that was rated at "low to zero" potential because of the extensive exposures of metamorphic, plutonic, and volcanic rocks, which are not conducive to hydrocarbon accumulation.

MINERAL RESOURCE APPRAISAL

Mined and prospected localities in and near the WSA are shown on plate 1, and table 1 lists and summarizes the assessment of their physical and mineral resource characteristics. The Manitowoc and El Campo Mines were not reevaluated during this appraisal because they were examined previously by this author and are discussed by Light and McDonnell (1983). Localities that have identified resources or may be of special interest are further described in the following discussions.

Paloma district

Most of the mining activity in the study area has taken place in an area locally known as the Paloma district (pl. 1, samples 1-146). The district covers an area of about 15 mi^2 near the center of the WSA and predominantly consists of Precambrian gneiss and schist that have been broken by faulting. Some of the faults served as "conduits for hypogene siliceous gold-bearing

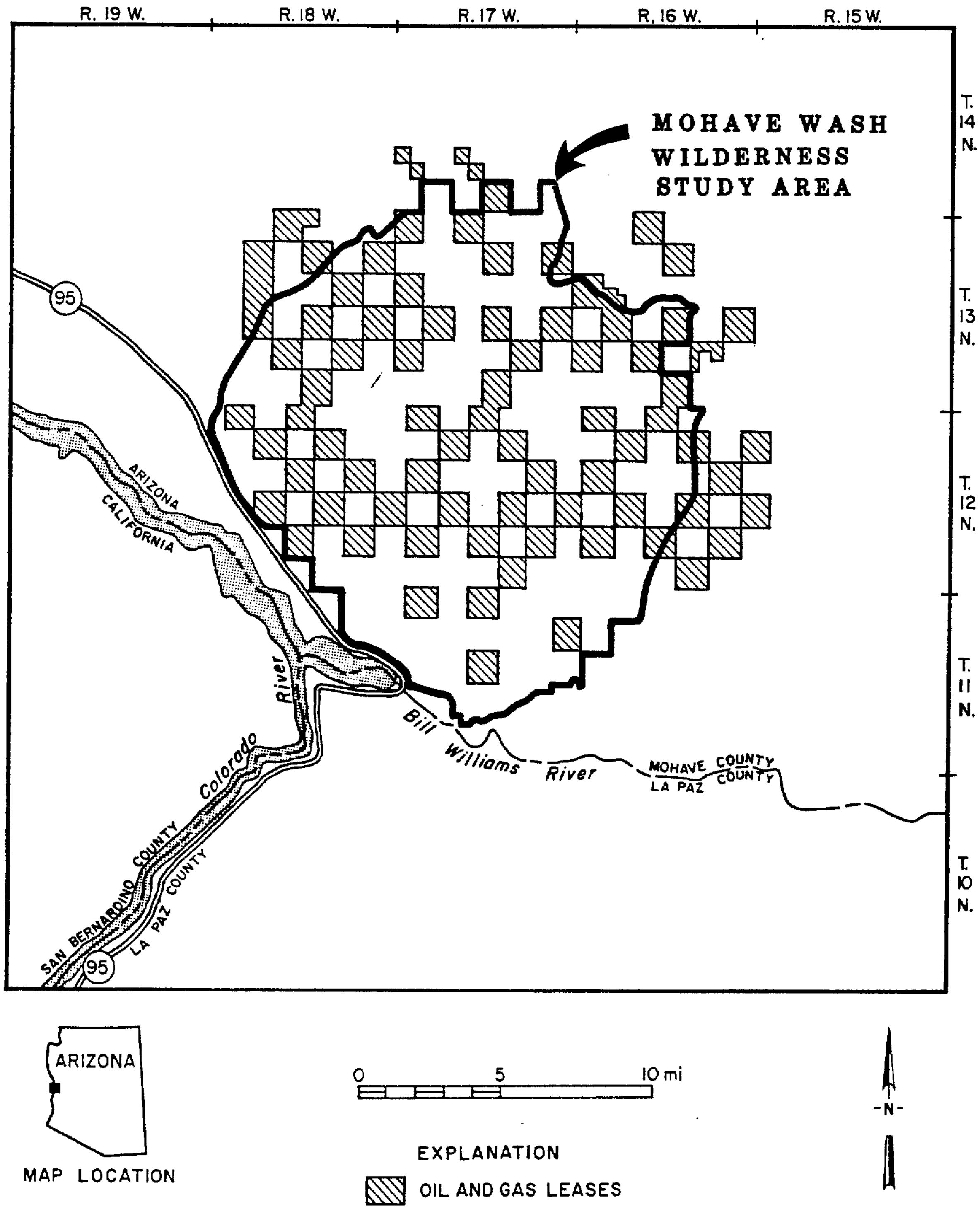


Figure 3.--Oil and gas leases in and near the Mohave Wash Wilderness Study Area, Mohave County, Arizona, as per Bureau of Land Management file data, 1987.

solutions, resulting in quartz fissure veins containing gold and some minor silver mineralization" (1975, unpublished Arizona Department of Mineral Resources file data, Phoenix, AZ). The veins are as thick as 12 ft and vary from massive white "bull" quartz, to vuggy, highly fractured quartz, to fracture-filling quartz veinlets. In reports on file with the Arizona Department of Mineral Resources (1975, unpublished file data) two 100-lb samples and a 300-lb sample of vein material from unspecified outcrops were submitted to the U.S. Bureau of Mines Research Center, Salt Lake City, Utah, for metallurgical testing. The tests showed that the veins are amenable to heap leaching for as much as a 96% gold recovery using a dilute cyanide solution and charcoal-in-pulp process.

Survey maps and sample data for workings and prospects in the Paloma district are presented in figures 4-11 and table 2. Pinpoint-size gold was seen at three localities (samples 93, 102, and 117) and gold concentrations from 6 to 28,100 ppb (0.820 oz/st) were detected in 127 of 146 samples taken in the district. Field observations and analytical results indicate that gold-mineralized quartz fissure veins occur throughout the district. Most of the veins pinch and swell, are discontinuous in exposure, and are intermittently mineralized. The irregular nature of the veins precluded making resource estimates in all but two mineralized areas, the JJ&C and Mohave, but the overall extent of mineralization suggests that gold resources are likely to exist in both lode and placer occurrences throughout the district.

JJ&C area

The JJ&C area is in sec. 16 and 17, T. 12 N., R. 17 W. (pl. 1, samples 1-46), and can be reached by following a wash about 1 mi westward from Mohave

Wash in sec. 15. As of April 1988, the area was not covered by mining claims and the name JJ&C was taken from past claim notices.

The main workings are two adits, one above the other (fig. 4), about 300 ft up the side of a ridge on the south side of the drainage. The upper adit was driven southwest on a fault zone that strikes N. 45° E. and dips 30°-75° SE. Quartz veins and veinlets pinch and swell to as thick as 2 ft and fill some fissures in the fault zone. Galena, pyrite, and minor malachite are visible along the vein system. The lower adit was driven basically parallel to, and about 30 ft (vertically) below the upper adit, apparently in an attempt to intercept the vein. As shown in figure 4, the vein dips at varying degrees to the southeast away from the lower adit. Although it appears in the surveyed plan view that the lower adit probably should intercept the vein, no similar structure is present in the adit. Assay data for samples taken in the workings (fig. 4) show gold and silver enrichment in the vein in the upper adit and trench, but notably lower concentrations in the lower adit, where no vein is exposed.

Gold concentrations for samples taken in the upper adit on the fissure vein range from 0.003 to 0.657 oz/st and are consistent enough to calculate grade and tonnage for a gold resource. Because the extent of the structure is questionable, projections were limited to 15 ft up and down dip and 30 ft beyond the face. About 1,000 st of indicated resources averaging 0.06 oz/st gold is estimated for the vein in the upper adit. The low resource value (about $24,000 at $400/oz gold) makes commercial extraction subeconomic, except for hand-sorted mining methods.

An adit and decline about 1/4 mi west of the main workings were driven on a massive quartz vein that strikes N. 28° E. and dips 30° NW. in diabase.

Although gold was detected in most of the samples, concentrations were insufficient to consider the gold a resource. (See fig. 5.)

Mohave area

The Mohave area covers workings and prospects in the NE. 1/4 sec. 28 and S. center sec. 21, T. 12 N., R. 17 W. (pl. 1, samples 82-98), and can be reached by a nonmaintained road in Paloma Wash. As of April 1988, no mining claims covered the workings and the name Mohave was taken from past claim notices.

A quartz fissure vein in the southern end of the Mohave area is of primary interest (samples 86-98). The vein is exposed by a 42-ft-deep shaft, a 30-ft-long decline, and several prospects. The vein can be traced through the workings and surface float in two separate segments, 180 ft and 100 ft long, and may be continuous for 600 ft. (See fig. 10.)

Analyses of vein samples 86 to 93 (fig. 10) show gold concentrations from 0.034 to 0.312 oz/st. Grade and tonnage calculations were made for the two traced segments (280 ft of length) and for the projected 600-ft-total length of the vein using an extension of 15 ft down dip. The average grade is estimated to be 0.16 oz/st gold. The traced segments are estimated to contain 250 st of indicated resources and the total 600-ft-long vein (two traced segments plus 320 ft projected in between) is estimated to contain an additional 300 st of inferred resources. The low resource value ($16,000-$35,000 at $400/oz gold) makes commercial extraction of the vein material subeconomic, except for hand-sorted mining methods.

Placer gold

Desert weathering makes the accumulation of placer gold extremely erratic, but unpublished Arizona Department of Mineral Resources file data and the presence of lode gold in the area indicate that a placer gold deposit is likely to exist in alluvium in the Paloma district. In addition, information supplied by claimants Milton Fuller (1988, written commun.) and S. Everett Ashcraft (1988, written commun.) show prospecting results favorable for the occurrence of placer gold and silver concentrations on the eastern side of the study area. Four panned-concentrate samples (table 2, nos. 183, 184, 187, 188) taken by Bureau personnel from drainages along the western and eastern flanks of the study area yielded minor (9-35 ppb) gold concentrations, and suggests that placer gold occurrences could exist along the eastern and western flanks of the study area.

Perlite

A 40-ft-long by 15-ft-wide exposure of perlite was found in SE. 1/4 sec. 18, T. 13 N., R. 16 W. (fig. 13, sample 173). Perlite is a glassy volcanic rock that is processed for use in construction, as insulation, concrete aggregate, plaster, tile, and wallboard; in industry as a filter and additive medium; and in agriculture as a soil conditioner and chemical carrier. A sample of the outcrop was tested for quality and was determined to be suitable for use in some expanded perlite end-products, but generally would not compete favorably with other commercially available perlite (table 3). The low quality, remote location, and small size exclude this perlite from being a resource.

Sand and gravel

Sand and gravel occurs in drainages and low-lying areas throughout the WSA. Material from Standard Wash along the northwestern study area boundary has been used in the construction, and was being considered for use in the rebuilding, of State Highway 95. The Arizona Department of Transportation dug 61 test pits in N. 1/2 sec. 31 and SE. 1/4 sec. 30, T. 13 N., R. 18 W. in 1986 and evaluated the sand and gravel for possible use in the rebuilding project. The material was concluded to be of moderate road gravel quality and will be made available to the contractor that rebuilds the highway (R. W. Krohn, 1988, Ariz. Dept. of Transportation, Phoenix, AZ, oral and written commun.). Resources of sand and gravel of similar quality are likely to be present inside the study area, but sufficient material exists outside to supply current and near future needs.

CONCLUSIONS

The study area has identified subeconomic resources of gold in quartz fissure veins in the Paloma district. Indicated resources of about 1,000 st averaging 0.06 oz/st gold was estimated for the JJ&C area and 250 st of indicated and 300 st of inferred resources averaging 0.16 oz/st gold were estimated for the Mohave area. Gold-bearing quartz veins occur throughout the district, but they pinch and swell, are discontinuous in exposure, and are intermittently mineralized. The pervasiveness of the veins and overall extent of mineralization suggest that additional gold resources are likely to exist elsewhere in the Paloma district.

The presence of lode gold, prospecting information supplied by claimants, and supportive Arizona Department of Mineral Resources file data suggest that placer gold is likely to occur in the Paloma district and along the eastern and western flanks of the WSA.

Perlite was found in the study area, but was determined to be not commercially competitive and is not considered a resource.

Sand and gravel is found in drainages and low-lying areas throughout the WSA. Material adjacent to the northwestern study area boundary was determined to be moderate road gravel quality, and has been used in highway construction. Resources of similar quality sand and gravel are likely to be present inside the WSA, but sufficient material exists outside to supply projected needs.

Oil and gas leases cover the study area in a checkerboard-like fashion and probably were in response to speculation that the Idaho-Wyoming overthrust belt may extend into Arizona. No hydrocarbon shows or discoveries are known in the area, and geologic evidence suggests that the study area has a "low to zero" potential for oil and gas resources.

RECOMMENDATIONS

The appraisal of the Paloma district was limited to prospected or mined vein exposures because an all-inclusive study was beyond the scope of this project. Many quartz veins in the district are undeveloped or disappear beneath alluvial cover and were therefore not appraised. The pervasiveness of gold in the quartz veins that were evaluated, and the extensiveness of unstudied quartz vein exposures suggest that other gold-bearing veins may be present and that a large-scale association is possible. A detailed appraisal (geological, mineralogical, geochemical, and geophysical) of all exposed quartz veins, followed by subsurface testing of significantly anomalous target areas is highly recommended.

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EXPLANATION, SYMBOLS, AND ABBREVIATIONS USED IN FIGURES 4-13.

SHAFT

BOTTOM OF SHAFT

ADIT

PROSPECT

OPENCUT

TRENCH

PIT

PILLAR

STOPE, down

STOCKPILE

INTERMITTENT STREAM, showing flow direction.

(±)40° SLOPE, showing inclination

DRIFT INTO FACING WALL

10° FOLIATION, showing inclination

45 VEIN, showing inclination, dashed where approximate.

CONTACT, dashed where approximate.

25 SAMPLE NUMBER AND LOCALITY
173 outcrop
155 panned concentrate

65 FAULT, showing vertical and inclined dip, dashed where approximate.

APPROXIMATE STUDY AREA BOUNDARY, ticks inside.

ROCK TYPE

Gneiss

Diabase

Schist

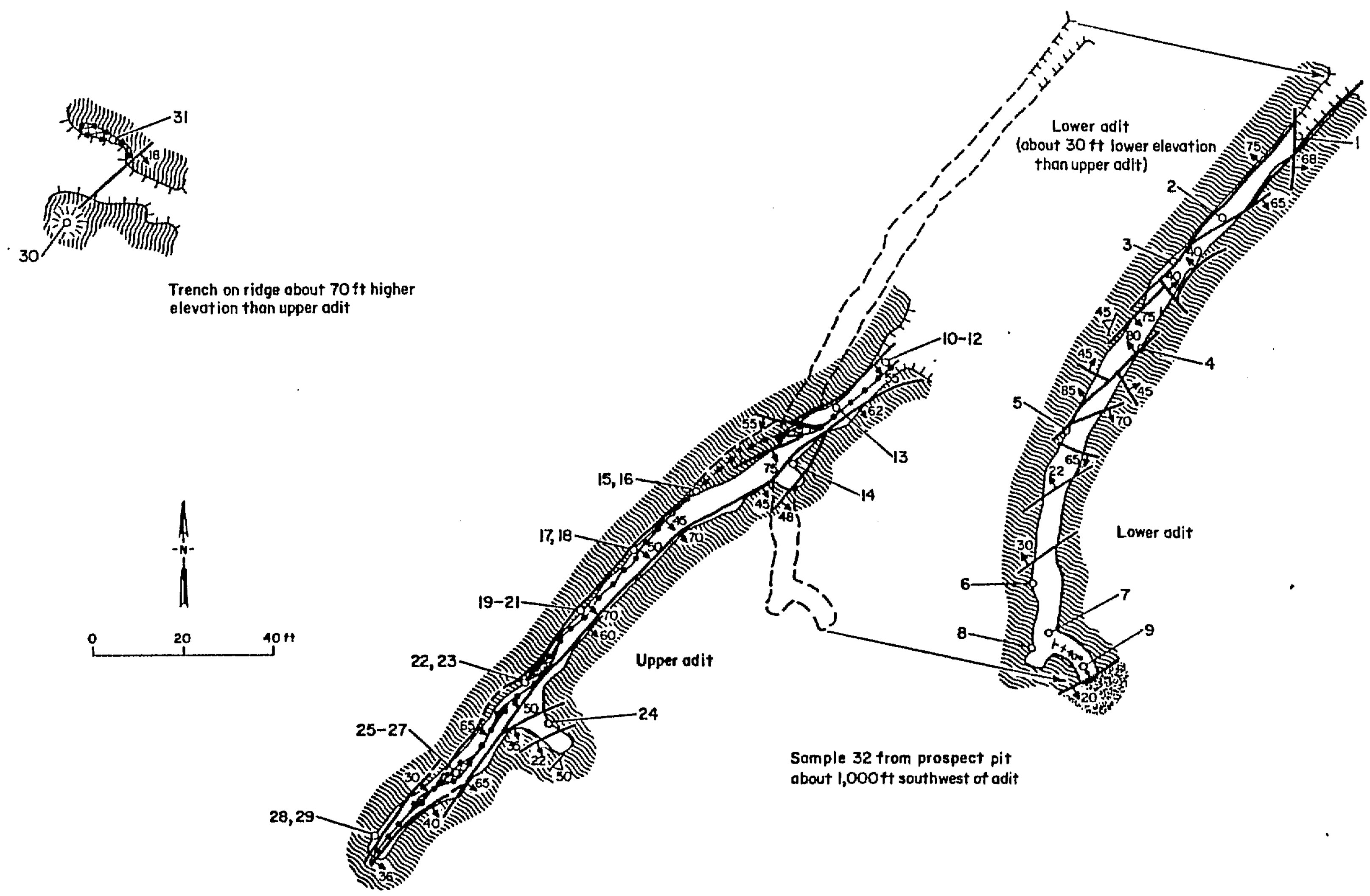
Pegmatite

Gravel

>	greater than
<	less than
xx	not applicable
---	less than lower detection limit

(N. 40° E., 82° SE.)	strike and dip
6 x 6 x 6 ft	length x width x depth

Analytical methods (showing abbreviation and lower detection limit) for samples shown in figures and tables are: direct irradiation and instrumental neutron activation for gold (Au, 5 ppb), silver (Ag, 5 ppm), barium (Ba, 100 ppm), iron (Fe, 0.5 %); by D.C. plasma emission spectroscopy for copper (Cu, 1 ppm), lead (Pb, 5 ppm), and silver (Ag, 0.5 ppm); and by cold vapor atomic absorption for mercury (Hg, 5 ppb).



Sample No.	Sample Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
							Lower adit			
1	Chip	4.0	26	---	1,000	42	1.5	35	108	Fault in gneiss; pinching and swelling quartz vein in argillized gneiss with moderate hematite.
2	do.	3.7	65	---	970	45	3.9	80	12	Do.
3	do.	1.5	25	6 (<0.5)[1]	830	9	2.9	115	10	Do.
4	do.	1.3	38	7 (<.5)[1]	590	12	3.1	545	48	Do.
5	do.	1.3	6	---	730	8	1.5	420	31	Do.
6	do.	.8	59	---	---	13	.9	260	2,228	Fault in gneiss; pinching and swelling quartz vein in argillized gneiss with 1/2-in.-long, red to yellow mimetite crystals in vugs.
7	do.	2.5	67	---	1,300	35	6.1	700	290	Fault in gneiss; quartz stringers, hematite after pyrite (?).
8	do.	1.0	26	---	300	5	3.6	335	11	Do.
9	do.	1.5	12	---	360	19	5.2	535	9	Do.
							Upper adit			
10	do.	.8	250 (0.006)[2]	--- (.7)[1]	1,300	92	3.6	40	540	Fault gouge next to quartz vein; chloritized and iron-oxide coated.
11	do.	.6	3,690 (.064)[2]	6 (1.8)[1]	110	120	1.3	40	485	Quartz fissure vein; minor pyrite, calcite, and hematite after pyrite.
12	do.	2.3	110 (.003)[2]	---	820	46	2.9	55	480	Fault gouge next to quartz vein; chloritized and iron-oxide coated.
13	do.	1.1	1,060 (.030)[2]	--- (.8)[1]	---	70	1.0	65	515	Fractured quartz fissure vein; pyrite, hematite after pyrite, and iron-oxide coating.
14	do.	.3	14,600 (.657)[2]	--- (2.1)[1]	280	820	2.8	295	4,100	Vuggy quartz fissure vein; galena, pyrite, minor malachite, and hematite after pyrite.
15	do.	1.3	5,520 (.133)[2]	10 (6.4)[1]	200	210	2.5	415	3,400	Do.
16	do.	1.3	815 (.019)[2]	--- (.7)[1]	910	190	3.5	75	1,400	Fault gouge next to quartz vein; chloritized and iron-oxide coated.
17	do.	1.0	2,240 (.065)[3]	--- (2.4)[1]	130	111	3.0	110	951	Massive quartz fissure vein; hematite after pyrite.
18	do.	1.9	140 (.004)[3]	--- (.6)[1]	810	115	4.0	270	957	Sheared gneiss next to quartz vein; partly chloritized and iron-oxide coated.
19	do.	.3	1,150 (.003)[2]	---	160	33	1.4	55	180	Sheared gneiss next to quartz vein; orange to red limonite.
20	do.	1.0	72 (.027)[2]	---	690	85	2.8	65	490	Quartz fissure vein; minor pyrite and hematite after pyrite.
21	do.	.5	250 (.004)[2]	---	890	97	2.1	60	325	Sheared gneiss next to quartz vein; orange to red limonite.

See footnotes at end of table.

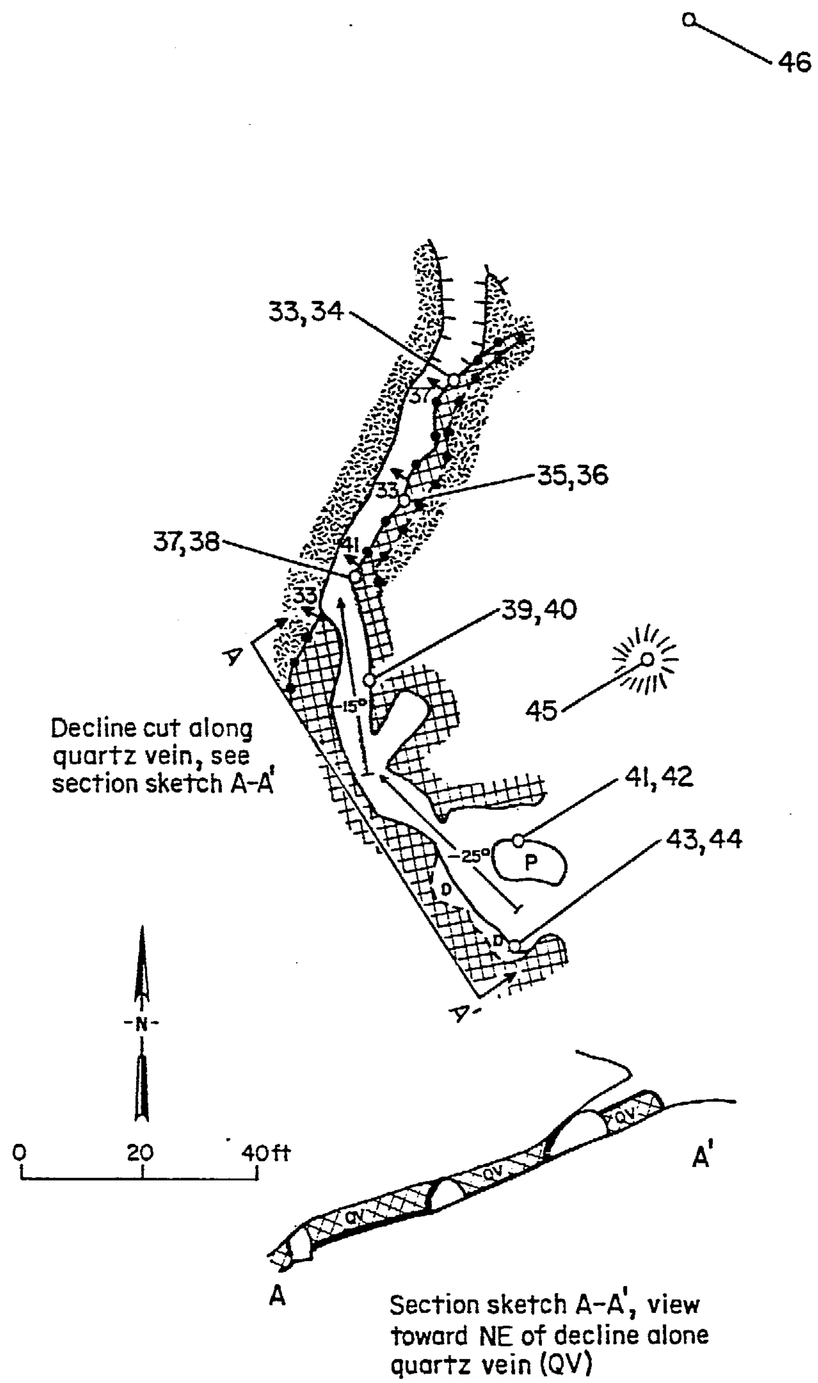
Figure 4.--Main workings in the JJ&C area.

Tabular data for fig. 4--Continued

Sample			Assay data							
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
22	Chip	0.8	3,230 (0.086)2/	---	110	40	1.3	125	290	Quartz fissure vein; hematite after pyrite.
23	do.	1.5	340 (.008)2/	---	1,000	35	2.9	235	112	Sheared gneiss next to quartz vein; minor hematite.
24	do.	2.3	14	---	790	9	3.1	330	31	Clayey gouge from intersection of two fault zones in gneiss; minor red to brown limonite.
25	do.	1.4	729 (.017)2/	---	290	14	3.0	100	170	Sheared gneiss next to quartz vein; limonite.
26	do.	2.2	7,180 (.206)2/	---	---	12	1.3	70	90	Vuggy quartz fissure vein; hematite after pyrite.
27	do.	2.6	872 (.003)2/	---	500	2,490	8.4	850	180	Sheared gneiss next to quartz vein; orange to red limonite.
28	do.	.8	130 (.003)2/	---	1,100	41	3.7	285	230	Do.
29	do.	.8	1,350 (.039)3/	---	---	3	1.4	60	26	Quartz fissure vein; disseminated pyrite and hematite after pyrite.
					Surface prospects					
30	Select	xx	3,980 (.095)2/	--- (5.0)1/	---	48	1.0	55	4,200	Stockpile; fractured quartz vein with pyrite, sphalerite, chalcopyrite, and hematite.
31	Chip	.5	3,300 (.096)3/	---	---	12	---	25	77	Fractured quartz vein; no mineralized zones noted.
32	do.	2.0	74	12 (3.2)1/	420	2,091	17.0	120	61	Clayey, altered gneiss at contact with diabase dike; abundant yellow to dark red limonite.

1/ Reanalysis by D.C. plasma emission spectroscopy, result in ppm.
2/ Reanalysis by fire assay, result in oz/st.
3/ Determined by mathematical conversion from ppb to oz/st.

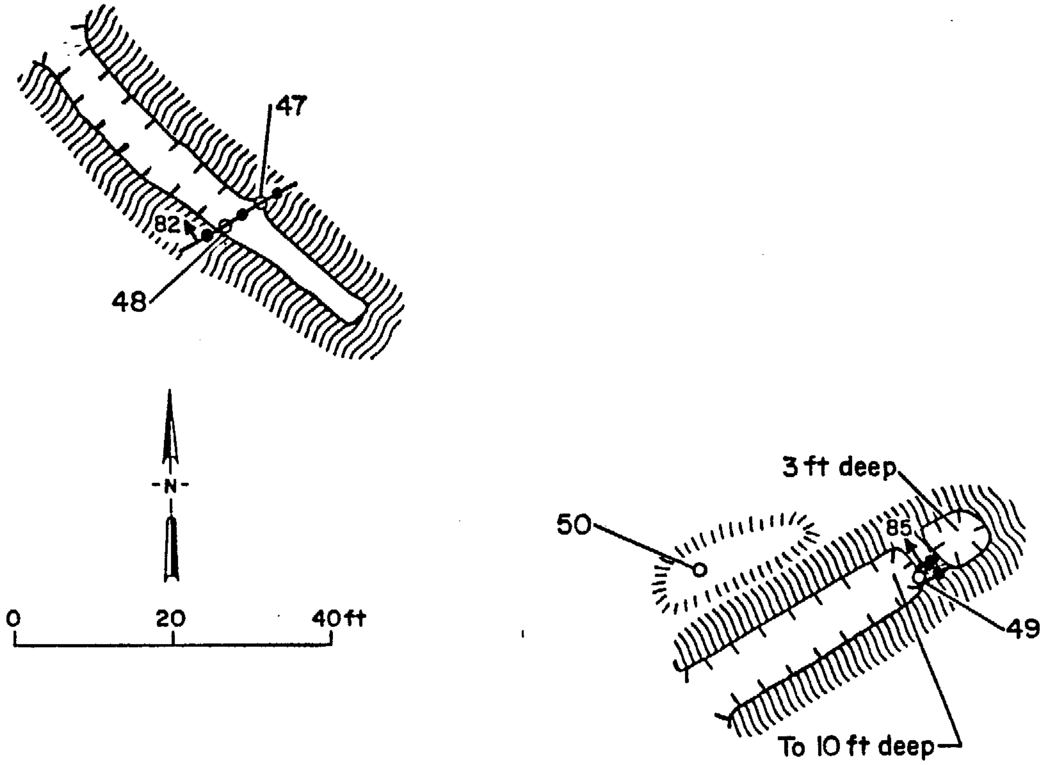
Figure 4.--Main workings in the JJ&C area--Continued



Sample			Assay data							
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
33	Chip	2.3	11	--- (0.8)1/	---	31	0.7	15	83	Quartz fissure vein; minor iron oxide.
34	do.	1.7	9	---	520	33	8.4	30	64	Clayey, sheared diabase next to quartz vein; abundant iron and manganese oxide.
35	do.	3.0	9	---	---	5	1.1	15	18	Quartz fissure vein; minor iron oxide.
36	do.	.7	10	---	---	150	5.4	50	920	Clayey, sheared diabase next to quartz vein; yellow to dark red limonite, and calcite veinlets.
37	do.	2.4	---	---	---	5	.7	35	39	Quartz fissure vein; minor iron oxide along fractures.
38	do.	.4	24	---	---	25	5.6	50	107	Clayey, sheared diabase next to quartz vein; abundant iron oxide.
39	do.	1.4	9	---	---	10	.9	80	119	Quartz fissure vein; minor iron oxide along fractures.
40	do.	.4	66	---	---	72	5.2	80	255	Clayey, sheared diabase next to quartz vein; abundant iron oxide.
41	do.	2.5	27	---	---	31	---	25	285	Quartz fissure vein; no mineralized zones noted.
42	do.	1.3	42	---	680	33	5.4	35	360	Clayey, sheared diabase next to quartz vein; abundant iron oxide and minor calcite veinlets.
43	do.	.8	150	--- (4.8)1/	---	835	1.4	40	6,000	Quartz fissure vein; galena, minor chrysocolla, malachite, and hematite.
44	do.	1.1	31	---	490	80	5.4	20	1,400	Clayey, sheared diabase next to quartz vein; abundant iron oxide.
45	Select	xx	490	19	---	14,000	1.3	270	2,950	Stockpile, vuggy quartz vein with chrysocolla, malachite, and iron oxide.
46	Chip	2.3	---	---	---	18	1.0	85	18	Outcrop, 50 ft NE. of adit portal; weathered and fractured quartz vein; minor iron and manganese oxide.

1/ Reanalysis by D.C. plasma emission spectroscopy, result in ppm.

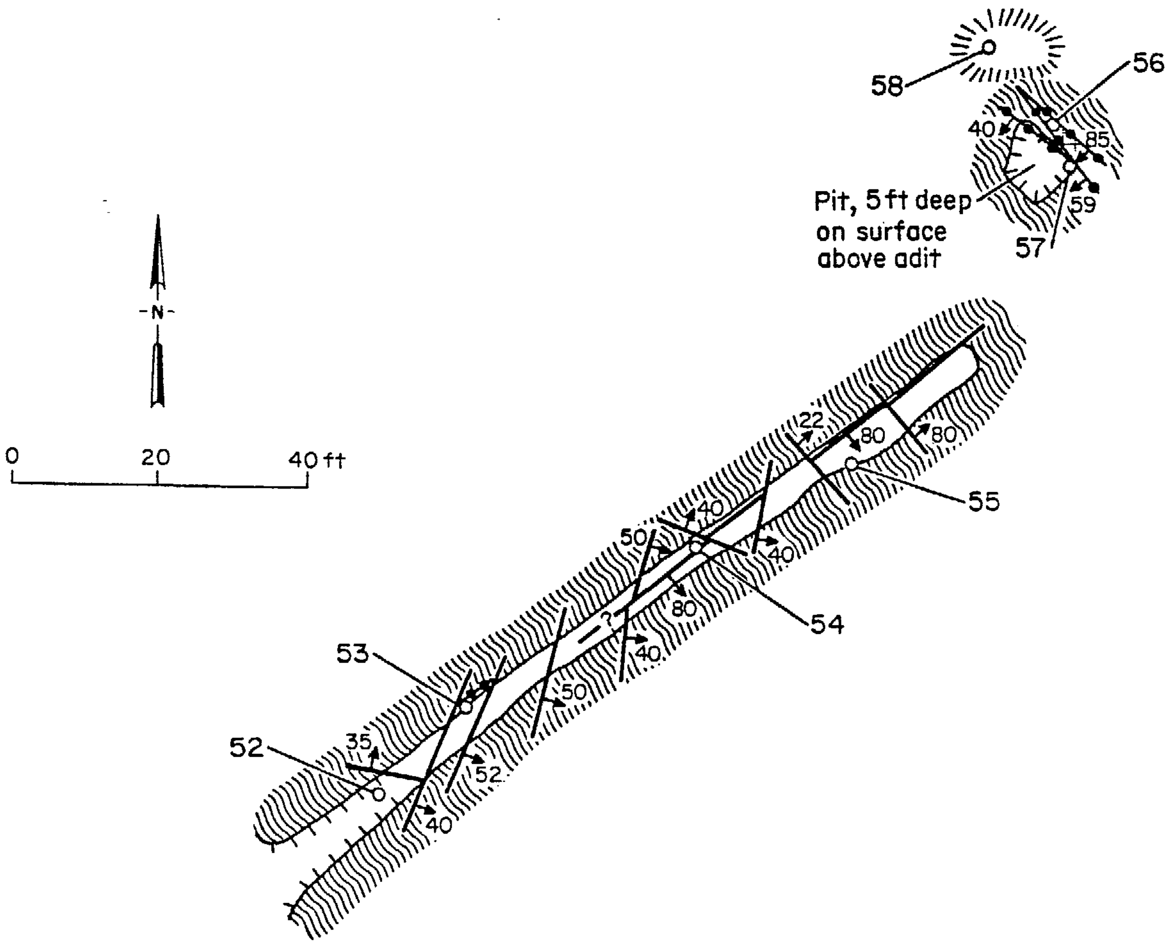
Figure 5.--Adit and decline west of main JJ&C workings.



Sample			Assay data								
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
47	Chip	1.2	10,100 (0.402)1/	---	740	8	3.0	30	9	Adit, 25 ft long; fault zone (N. 62° E., 82° NW.) in gneiss; brecciated quartz and abundant limonite.
48	do.	.9	6,970 (.245)1/	---	720	6	4.0	35	12	Do.
49	do.	1.4	963 (.042)1/	---	130	5	.6	85	7	Trench, 30 x 8 x 10 ft; brecciated and recemented quartz vein (N. 60° E., 85° NW.); iron oxide along fractures.
50	Select	xx	2,960 (.125)1/	---	---	22	1.0	5	10	Stockpiles near trench; quartz vein material; vugs lined with quartz and calcite, and hematite after pyrite.
51	Chip	.8	16	---	---	3	---	10	9	Outcrop, 200 ft NE. of trench; quartz vein; minor limonite.

1/ Reanalysis by fire assay, result in oz/st.

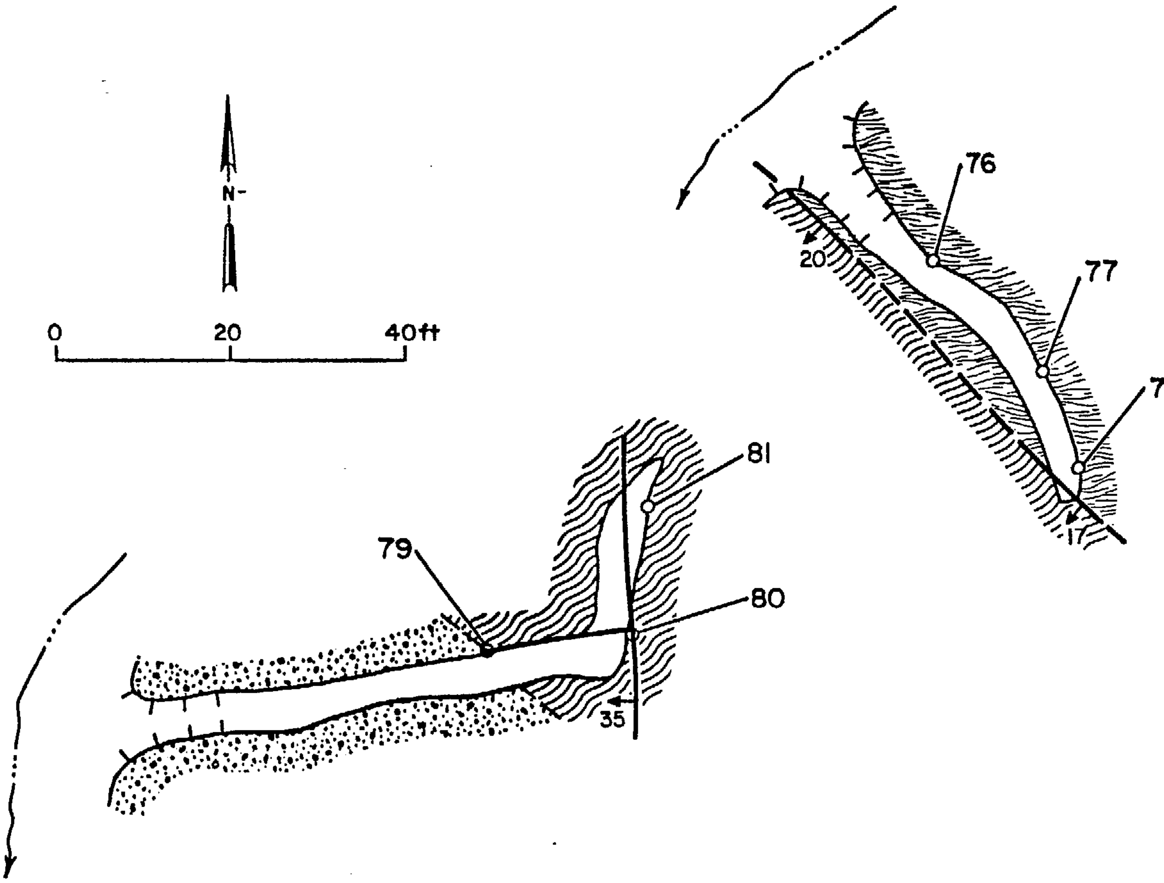
Figure 6.--Adit and trench in Pacos area.



Sample			Assay data								
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
52	Chip	4.0	22	---	1,400	430	7.4	20	14	Brecciated gneiss; chloritized, no mineralized zones noted.
53	do.	1.7	2,600 (0.113)1/	7 (3.8)2/	670	220	3.3	50	29	Massive quartz vein; hematite after pyrite, iron oxide along fractures.
54	do.	.9	---	8 (<.5)2/	1,500	35	6.8	25	16	Intersection of fractures in gneiss; iron-oxide staining.
55	do.	1.4	12	7 (<.5)2/	1,400	52	7.2	25	14	Do.
56	do.	3.8	1,980 (.058)3/	--- (2.7)2/	650	772	3.5	10	461	Quartz fissure vein; minor copper mineral coatings and iron oxide along fractures.
57	do.	.7	28,100 (.820)3/	13 (7.4)2/	350	3,000	2.5	10	715	Do.
58	Select	xx	10,200 (.298)3/	521 (>50)2/	---	>20,000	5.9	100	>10,000	Stockpile; high grade of mineralized quartz vein; galena and malachite.

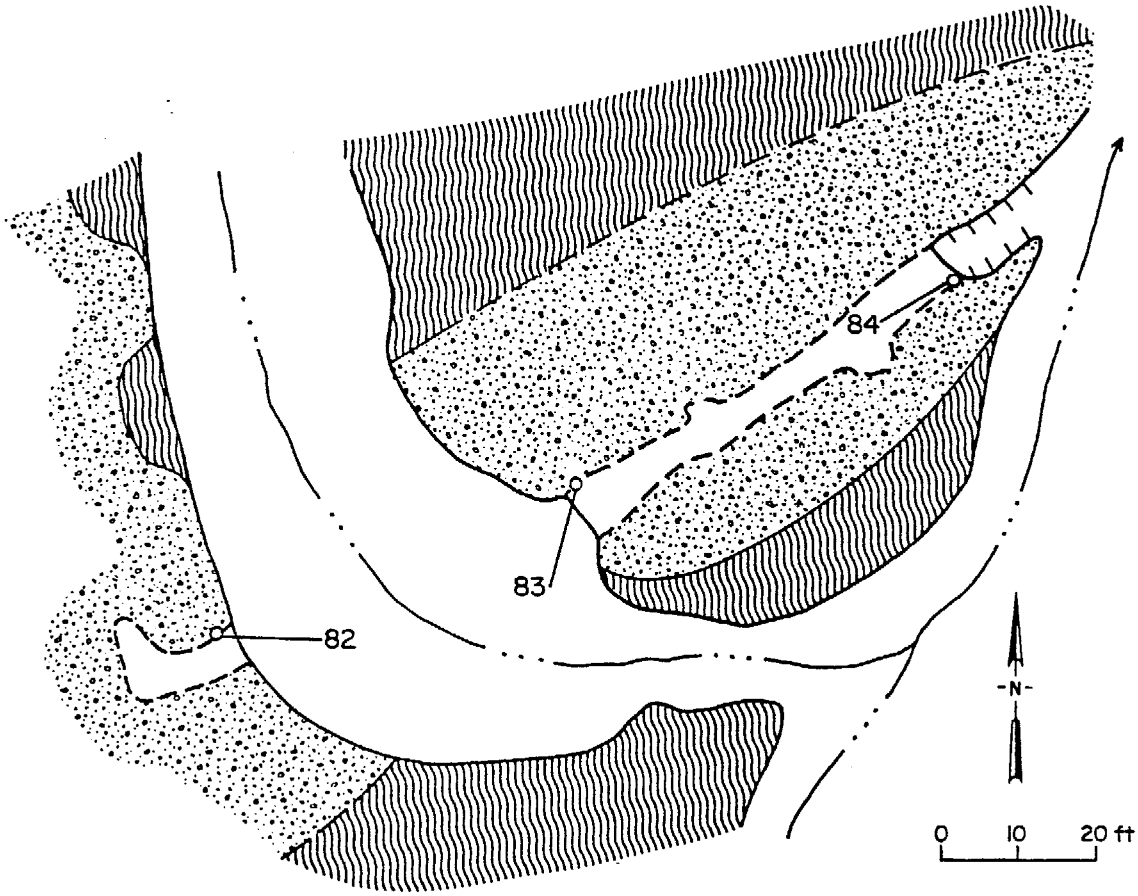
1/ Reanalysis by fire assay, result in oz/st.
2/ Reanalysis by D.C. plasma emission spectroscopy, result in ppm.
3/ Determined by mathematical conversion from ppb to oz/st.

Figure 7.--Adit in Golden Slipper area.



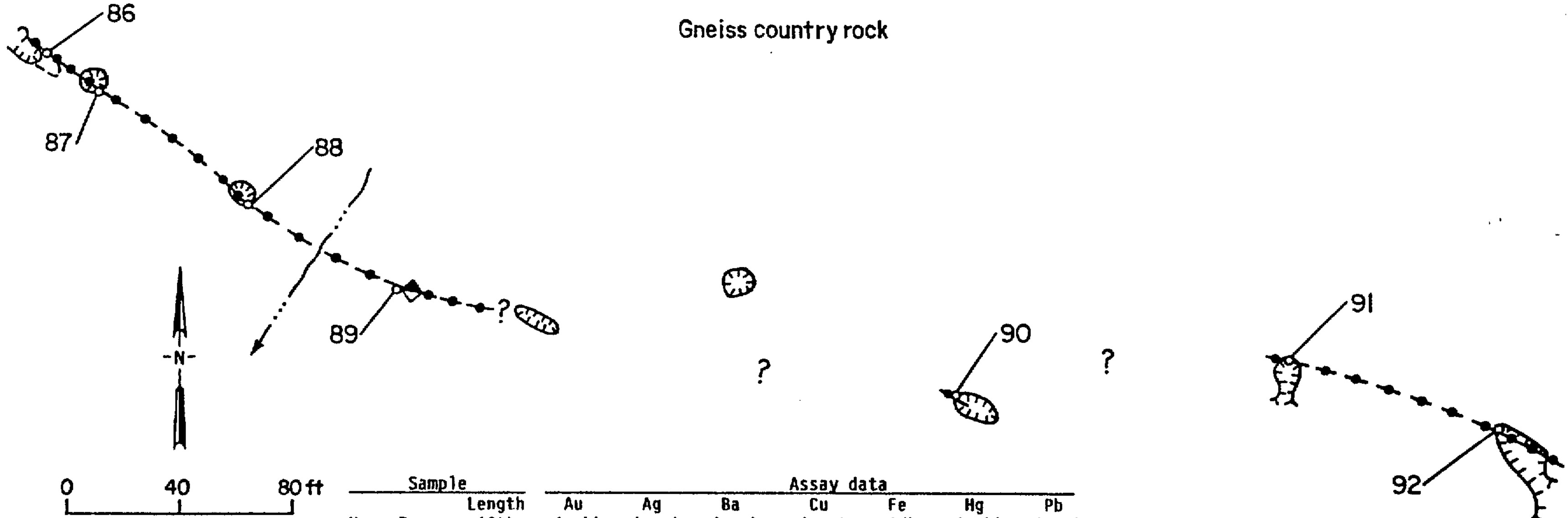
Sample			Assay data							
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
76	Chip	0.9	6	---	150	18	1.0	15	10	Quartz-rich zone; no mineralized zone noted.
77	do.	.9	5	---	510	18	6.5	55	7	Clayey fault gouge; iron and manganese oxide.
78	do.	.8	---	---	230	15	2.3	30	15	Quartz-rich zone; no mineralized zone noted.
79	do.	1.4	7	---	310	16	7.2	35	12	Weathered gneiss below caliche; iron and manganese oxide.
80	do.	1.2	---	---	840	8	5.4	330	19	Fault gouge; minor quartz stringers and iron and manganese oxide.
81	do.	1.5	---	---	390	12	5.1	35	12	Do.

Figure 8.--Adits in Rincon #1 area.



Sample			Assay data							
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
82	Chip	3.3	11	---	1,600	25	5.1	20	79	Adit, 15 ft long; weakly-cemented gravel in old stream channel.
83	do.	3.0	14	---	1,800	22	5.0	25	68	Tunnel, 65 ft long; weakly-cemented gravel in old stream channel.
84	do.	5.8	5	6	1,500	18	6.0	15	24	Do.
85	Pan con	xx	---	---	810	20	55.9	15	36	Panned concentrate of sediment taken about 100 ft down drainage from adit and tunnel.

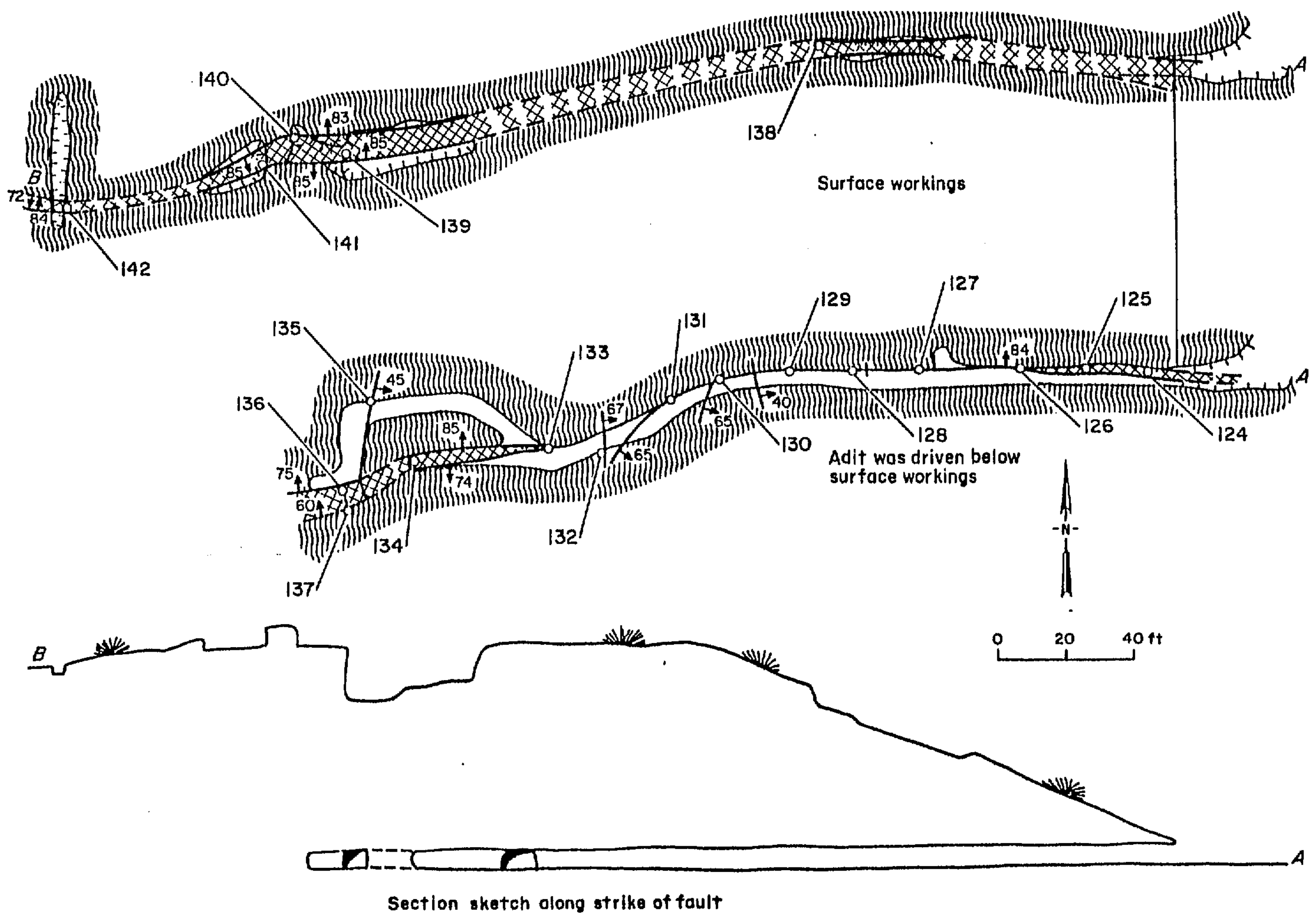
Figure 9.--Tunnel and adit in Mohave area.



Sample No.	Sample Type	Sample Length (ft)	Assay data Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
86	Chip	1.3	5,630 (0.144)1/	---	380	510	2.9	20	1,350	Decline, 35° slope, 30 ft long; massive quartz vein (N. 72° W., 33° SW.); minor hematite.
87	do.	.5	1,130 (.034)1/	---	320	540	2.2	10	620	Pit, 7 x 7 x 12 ft; massive quartz vein (N. 65° W., 52° SW.); minor hematite.
88	do.	.6	1,240 (.036)2/	---	360	30	2.0	25	69	Pit, 7 x 7 x 5 ft; quartz vein (N. 56° W., 60° SW.); minor hematite.
89	do.	.6	6,010 (.203)1/	---	---	68	1.2	30	490	Shaft (inaccessible), 42 ft deep; quartz vein (N. 70° W., vertical) between gneiss and diabase; minor hematite.
90	do.	.3	2,570 (.105)1/	---	590	10	5.2	15	25	Pit, 15 x 8 x 5 ft; massive quartz vein (N. 70° W., vertical); minor hematite.
91	do.	.8	12,800 (.312)1/	---	490	470	4.3	125	2,450	Pit, 9 x 7 x 10 ft; fractured quartz vein (N. 87° E., 79° SE.); minor hematite.
92	do.	1.2	6,550 (.191)1/	---	910	260	3.6	100	740	Trench, 30 x 10 x 5 ft; quartz vein (N. 70° W., 74° SW.); abundant hematite coating.
93	Select	xx	8,230 (.234)1/	6	110	250	2.8	145	560	High-grade composite from dumps; quartz vein material; visible gold, pyrite, galena, and limonite gossan.

1/ Reanalysis by fire assay, result in oz/st.
2/ Determined by mathematical conversion from ppb to oz/st.

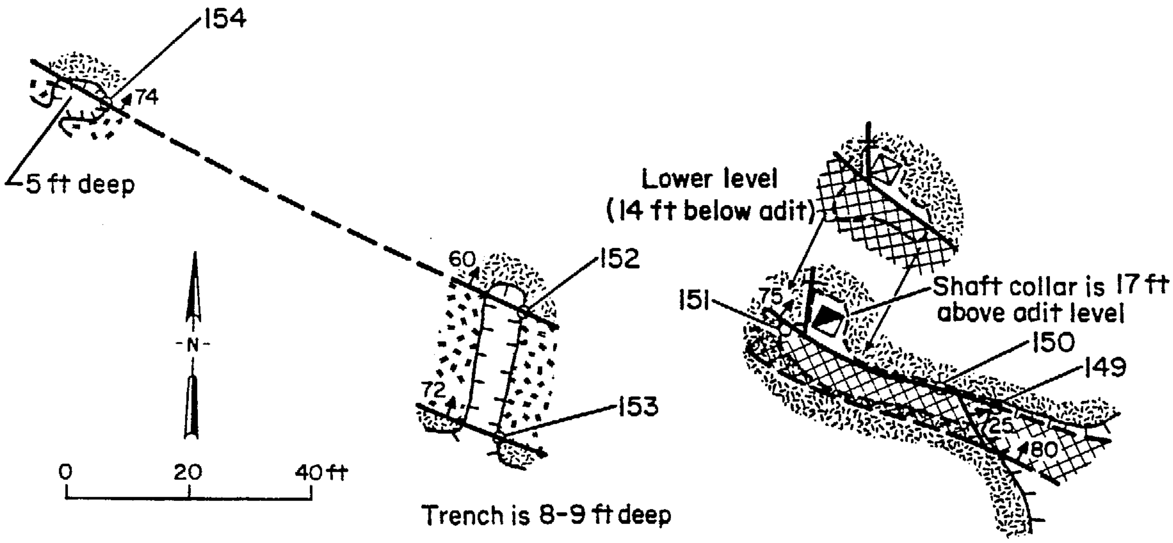
Figure 10.--Workings and prospects on a quartz vein in Mohave area.



Sample			Assay data							
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
						Adit				
124	Chip	1.4	---	---	630	7	7.5	5	42	Gneiss, andesite, and quartz in fault zone gouge ; iron-oxide coating.
125	do.	1.6	16	---	2,100	3	6.9	30	32	Do.
126	do.	1.0	68	---	3,700	2	27.0	45	42	Do.
127	do.	.8	8	---	900	2	21.0	65	34	Do.
128	do.	.4	3,390 (0.063)1/	---	2,600	32	8.3	55	315	Quartz fissure vein; minor specular hematite.
129	do.	.6	2,890 (.088)1/	--- (0.5)2/	3,700	138	8.9	55	250	Do.
130	do.	1.2	130	---	16,800	3	12.0	80	51	Gneiss, andesite, and quartz in fault zone gouge; iron-oxide coating.
131	do.	1.6	---	---	11,400	1	6.2	60	178	Do.
132	do.	1.8	---	--- (.6)2/	7,100	1	5.4	40	35	Crosscutting fractures in gneiss; specular hematite and chalcedonic quartz.
133	do.	.5	190	---	17,400	7	14.0	25	39	Gneiss gouge; abundant hematite and quartz veinlets.
134	do.	4.0	32	---	3,100	4	8.3	40	43	Do.
135	do.	1.7	---	---	1,800	3	8.7	5	11	Crosscutting fractures in gneiss; specular hematite and calcite veinlets.
136	do.	.6	120	--- (.6)2/	10,000	4	12.0	55	66	Gneiss, andesite, and quartz in fault zone gouge; abundant hematite.
137	do.	1.0	11	7 (<.5)2/	1,800	5	6.0	10	10	Fault zone in gneiss; iron-oxide coating.
						Surface workings				
138	do.	5.3	---	8 (<.5)2/	1,800	2	6.6	30	22	Fault zone in gneiss; quartz pod and stringers, calcite veinlets, and iron-oxide coating.
139	do.	5.0	220	---	1,900	25	5.2	60	94	Do.
140	do.	1.0	---	---	1,600	4	11.0	15	27	Fault in gneiss; 1-in.-thick quartz veinlet.
141	do.	.6	10,800 (.357)1/	11 (2.4)2/	4,000	121	4.0	65	167	Fault zone in gneiss; quartz and calcite stringers, iron-oxide coating.
142	do.	3.7	43	---	1,400	4	4.4	15	14	Fault zone in gneiss; minor specular hematite.
						Nearby prospects				
143	do.	2.0	6	---	160	10	3.4	10	---	Pit, 5 x 6 x 2 ft; vuggy, weathered quartz vein; iron- and manganese-oxide coating, hematite after pyrite.
144	do.	1.0	6	---	340	4	---	5	---	Pit, 7 x 6 x 3 ft; same as sample 143.
145	do.	1.5	6	6 (<.5)2/	370	3	2.3	5	---	Pit, 7 x 6 x 5 ft; quartz fissure vein (N. 78° E., 74° NW.).
146	do.	3.7	---	--- (.5)2/	11,100	2	.8	25	7	Pit, 4 x 4 x 3 ft; massive quartz fissure vein (N. 60° E., 77° NW.).

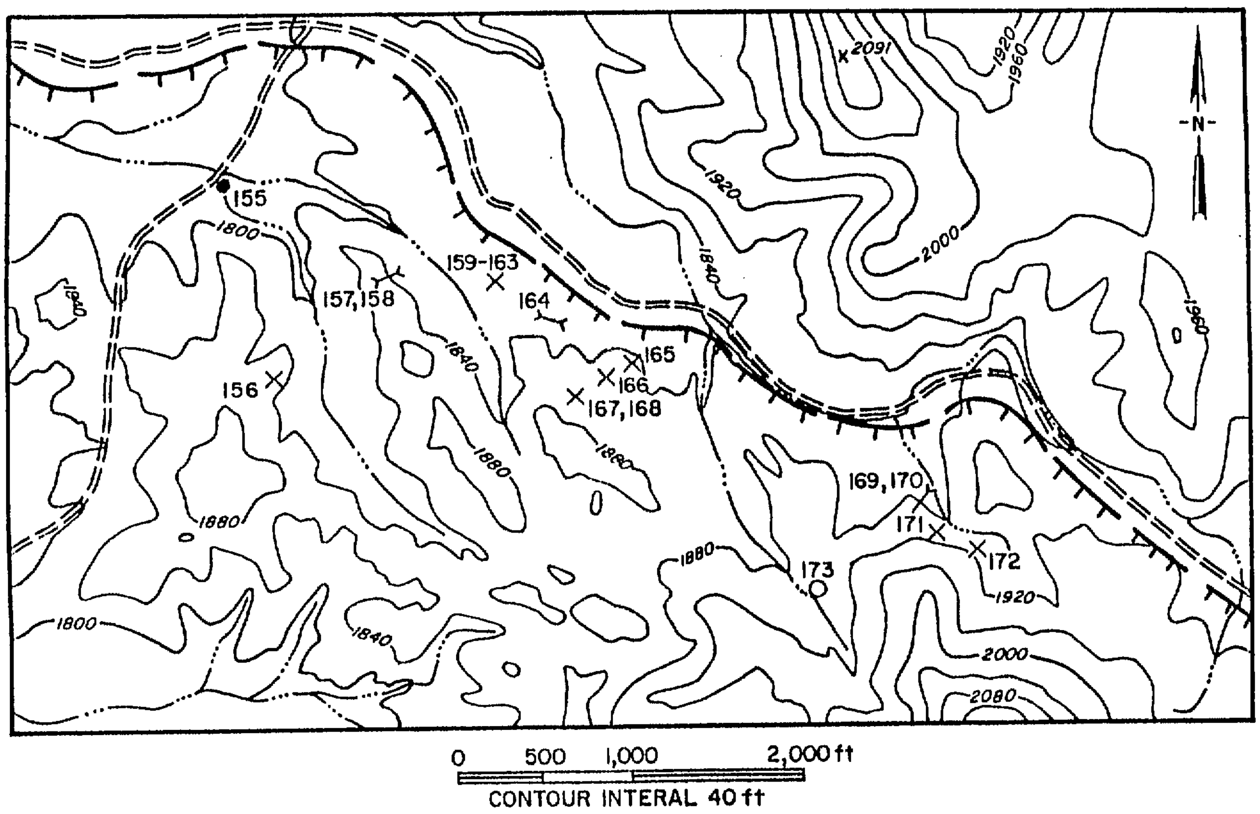
1/ Reanalysis by fire assay, result in oz/st.
2/ Reanalysis by D.C. plasma emission spectroscopy, result in ppm.

Figure 11.--Workings on the Dee claims.



Sample			Assay data								
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
149	Chip	1.3	110	---	1,200	117	7.8	125	527	Fault zone in diabase; minor hematite.
150	do.	1.3	140	10	1,000	36	8.1	60	550	Do.
151	do.	2.9	87	---	1,200	8	6.6	70	270	Do.
152	do.	.8	22	---	840	7	3.3	50	109	Fault contact between diabase and pegmatitic granite dike.
153	do.	.8	778	---	670	5	7.6	250	18	Do.
154	do.	1.2	210	---	580	24	4.8	110	528	Do.

Figure 12.--Workings near the Manitowoc Mine.



Sample No.	Sample Type	Sample Length (ft)	Assay data Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
155	Pan con	xx	---	---	1,200	48	12.0	20	221	Panned concentrate of basaltic stream sediment down drainage from prospects in Evelyn Lode area.
156	Chip	4.0	---	120	1,800	5,500	3.5	30	600	Pit, 8 x 6 x 5 ft; fault gouge (N. 24° W., 80° SW.) in basalt; chrysocolla and malachite coating, minor quartz-lined vugs, and iron and manganese oxide.
157	do.	2.8	---	8	700	3,524	2.2	15	195	Do.
158	do.	1.1	---	---	730	1,150	2.3	45	1,700	Trench, 40 x 4 x 4 ft; fault zone (N. 48° W., 83° SW.) in pegmatitic granite; sericitic alteration, chrysocolla, hematite, and minor galena.
159	Select	xx	25	240	1,000	>20,000	1.9	650	1,850	Stockpile; silicified basalt; abundant chrysocolla and malachite.
160	Chip	1.0	22	654	1,100	>20,000	2.4	3,250	420	Opencut, 13 x 6 ft; silicified basalt; abundant chrysocolla and malachite.
161	do.	.8	15	120	1,200	10,500	2.0	60	1,100	Pit, 10 x 10 x 2 ft; silicified basalt fault gouge; abundant chrysocolla and malachite coating, and quartz veinlets.
162	do.	.9	7	59	2,100	4,200	3.0	110	1,700	Pit, 7 x 4 x 3 ft; fault zone (N. 40° W., 85° SW.) in silicified basalt; abundant chrysocolla and malachite coating.
163	do.	.6	7	80	1,300	15,000	3.3	80	1,500	Opencut, 15 ft long; fault zone (N. 30-45° W., vertical) in silicified basalt; abundant chrysocolla and malachite coating.
164	Grab	xx	6	---	1,400	12	5.0	40	21	Trench, 73 x 6 x 3 ft; altered basalt from dump.
165	do.	xx	---	---	340	22	6.8	55	6	Pit, 5 x 4 x 3 ft; basaltic dump material; vesicular with calcite veinlets and hematite.
166	Chip	1.1	---	---	940	68	1.6	40	12	Opencut, 10 ft long; fault (N. 20° W., 80° NE.) cutting basalt/tuff contact; minor limonite and quartz veinlets.
167	do.	.9	---	---	1,700	28	3.7	25	15	Opencut, 10 x 5 ft; fault zone (N. 20° W., vertical to 70° NE.) in basalt; chloritized, and calcite veinlets.
168	do.	1.3	---	7	3,000	76	5.9	25	19	Do.
169	do.	1.2	---	64	4,200	>20,000	5.2	20	56	Adit, 9 ft long; fault (N. 47° W., 77° NE.) in basalt; chrysocolla, malachite, azurite, and hematite.
170	Select	xx	---	140	3,000	>20,000	4.8	40	69	Stockpile; high grade of copper mineralized basalt from adit.
171	Chip	1.5	6	110	4,000	9,400	5.1	130	171	Opencut, 15 x 5 ft; fault zone (N. 10° W., 18° NE.) in basalt; chrysocolla, malachite, azurite, and calcite veinlets.
172	do.	1.4	---	13	3,900	455	7.5	35	92	Opencut, 14 x 4 ft; contact between basalt and clayey, hydrothermally altered zone; malachite, azurite, and chrysocolla.
173	do.	Random	xx	xx	xx	xx	xx	xx	xx	Outcrop, 15 x 40 ft; perlite exposure. See table 3 for testing results.

Figure 13.--Workings in the Evelyn Lode area.

Table 1.--Summary of mines, prospects, and mineral occurrences in and near the Mohave Wash Wilderness Study Area.

[*, locality covered by unpatented lode claim(s) on file with BLM as of April 1988.]

Sample no.	Name and location	Description	Text fig. or table no.	Sample and resource data
		Paloma district		
1-32	JJ&C W. center sec. 16, T. 12 N., R. 17 W.	Two adits, 160 and 140 ft long, driven subparallel, one above the other, and misc. prospects. Upper adit follows a pinching and swelling quartz fissure vein with minor pyrite, galena, malachite, and hematite after pyrite. Lower adit appears to be an unsuccessful attempt to intercept the same vein; has minor quartz vein exposed with mimetite crystals in vugs.	Fig. 4	Thirty-one chip and one select sample taken. Gold detected in all 23 samples taken along vein, from 14 to 14,600 ppb (reanalysis = 0.657 oz/st); minor silver and some elevated lead concentrations. Resource estimate: 1,000 st averaging 0.06 oz/st gold.
33-46	JJ&C E. center sec. 17, T. 12 N., R. 17 W.	Adit, 50 ft long, with connecting decline and prospects, cut on a massive quartz vein with abundant iron oxide and minor chrysocolla and malachite.	Fig. 5	Thirteen chip and one select sample taken. Gold detected in 12 samples, from 9 to 490 ppb, average = 63 ppb. Some elevated lead concentrations.
47-51	Pacos SE. 1/4 sec. 17, T. 12 N., R. 17 W.	Adit, 25 ft long, and trench, 30 ft long. Adit crosscuts 1-ft-wide fault zone; trench cut on quartz fissure vein. Minor hematite after pyrite.	Fig. 6	Four chip and one select sample taken. Two chip samples taken in adit on fault contained 0.402 and 0.245 oz/st gold. One chip sample taken on vein in trench contained 0.042 oz/st gold.
52-58	Golden Slipper NW. 1/4 sec. 19, T. 12 N., R. 17 W.	Adit, 100 ft long, and pit on discontinuous quartz vein with minor galena, copper-oxide minerals, and iron-oxide staining.	Fig. 7	Six chip and one select sample taken. Gold detected in 6 samples, from 12 to 28,100 ppb (reanalysis = 0.894 oz/st).
59-62	Golden Slipper Center sec. 19, T. 12 N., R. 17 W.	Bulldozer cut, opencut, and pits on massive quartz vein. Iron and manganese oxide along fractures and sparse pyrite.	Table 2	Gold detected in all 4 chip samples. Concentrations ranged from 11 to 10,600 ppb (reanalysis = 0.363 oz/st).
63-67	Paloma prospect NW. 1/4 sec. 20, T. 12 N., R. 17 W.	Two adits, 12 and 20 ft long, on contact between gravel and gneiss, and prospect pits on quartz vein. No mineralized zone seen in adits. Minor malachite, chrysocolla, and iron oxide are associated with quartz vein.	Table 2	Three chip, one select, and one panned-concentrate sample taken. One chip sample of quartz vein in a pit contained 1,100 ppb (reanalysis = 0.041 oz/st) gold and a select of vein from dump at pit contained 4,470 ppb (reanalysis = 0.165 oz/st) gold.

Table 1.--Summary of mines, prospects, and mineral occurrences in and near the Mohave Wash Wilderness Study Area--Continued

Sample no.	Name and location	Description	Text fig. or table no.	Sample and resource data
68-70	SA W. center sec. 21, T. 12 N., R. 17 W.	Opencut, 20 ft long, on quartz vein. Galena, sparse chrysocolla, and hematite after pyrite.	Table 2	Two chip samples of vein contained 2,360 ppb (reanalysis = 0.148 oz/st) and 29 ppb gold, and a select of the dump contained 8,390 ppb (reanalysis = 0.445 oz/st) gold.
71-81	* Rincon #1 SE. 1/4 sec. 20, T. 12 N., R. 17 W.	Two adits, 65 and 40 ft long, driven in faulted gneiss and quartz-rich zones. Opencut and pits cut on massive quartz vein. Chrysocolla and chalcopyrite in the vein, iron oxide in fault gouge.	Fig. 8; table 2.	Ten chip and one select sample taken. Chip samples from adits contained minor gold, one chip sample of the quartz vein contained 2,150 ppb (reanalysis = 0.090 oz/st) gold, and the select of vein contained 2,260 ppb (reanalysis = 0.078 oz/st) gold.
82-85	Mohave S. center sec. 21, T. 12 N., R. 17 W.	Tunnel, 65 ft long, and adit, 15 ft long, driven in weakly-cemented gravel in old stream channel. No mineralized zone noted.	Fig. 9	Three chip and one panned-concentrate sample taken. Minor (5-14 ppb) gold and elevated barium concentrations detected in the chip samples.
86-98	Mohave NE. 1/4 sec. 28, T. 12 N., R. 17 W.	Inaccessible shaft, 42 ft deep; decline, 30 ft long; and several pits and trenches dug on quartz fissure vein. Pinpoint-size visible gold, pyrite, galena, and hematite.	Fig. 10; table 2.	Ten chip, two select, and one panned-concentrate sample taken. Seven chip samples contained from 1,130 ppb (reanalysis = 0.034 oz/st) to 12,800 ppb (reanalysis = 0.312 oz/st) gold and one select sample contained 8,230 ppb (reanalysis = 0.234 oz/st) gold. Vein may be continuous for 600 ft. Resource estimate: 250-500 st, containing 0.14-0.16 oz/st gold.
99-104	* WA-1 SW. 1/4 sec. 28 and NW. 1/4 sec. 33, T. 12 N., R. 17 W.	Prospect pits and trenches dug on quartz fissure veins in gneiss. Veins are massive to fractured and vuggy. Pinpoint-size visible gold, galena, minor chrysocolla and chalcopyrite, and abundant iron oxide. A gouge zone in one pit has been hydrothermally altered and contained wulfenite.	Table 2	Two chip, three select, and one panned-concentrate sample taken, all contained gold except concentrate, samples averaged 0.12 oz/st. Elevated concentrations of lead, copper, and mercury also detected.
105-114	H&L NE. 1/4 sec. 33, T. 12 N., R. 17 W.	Bulldozer cut and 80-ft-long opencut with several smaller pits, cuts, and dogholes at two prospected localities. Massive to fractured and vuggy quartz vein in gneiss. Minor chrysocolla and abundant iron oxide.	Table 2	Seven chip and three select samples taken, all contained detectable gold from 6 to 5,820 ppb (reanalysis = 0.168 oz/st), averaging 1,485 ppb. Elevated barium and copper concentrations also detected.

Table 1.--Summary of mines, prospects, and mineral occurrences in and near the Mohave Wash Wilderness Study Area--Continued

Sample no.	Name and location	Description	Text fig. or table no.	Sample and resource data
115-123	* Rad #2 NE. 1/4 sec. 34 and NW. 1/4 sec. 35, T. 12 N., R. 17 W.	Several opencuts, trenches, and pits dug on fractured and vuggy quartz vein and fault zones in gneiss and andesite. Pinpoint-size gold, specular hematite, minor chrysocolla, and abundant iron oxide.	Table 2	Six chip, two select, and one grab sample taken, all contained detectable gold from 8 to 5,560 ppb (reanalysis = 9,100 ppb), averaging 1,118 ppb. Minor silver and elevated barium concentrations also detected.
124-146	* Dee S. 1/2 sec. 26, T. 12 N., R. 17 W.	Adit, 250 ft long, and several trenches and pits dug on a fissure quartz vein and fault zones in gneiss. Specular hematite and hematite after pyrite.	Fig. 11	Twenty-three chip samples taken, 16 contained gold from 6 to 10,800 ppb (reanalysis = 0.357 oz/st), averaging 1,121 ppb. Only four samples had gold concentrations greater than 200 ppb (0.006 oz/st) and uniform dispersion is lacking, precluding a resource estimate. Minor silver and elevated barium concentrations also detected.
		Other prospected areas		
147-154	Unnamed (Near Manitowoc Mine) SW. 1/4 sec. 16 and NW. 1/4 sec 21, T. 13 N., R. 18 W.	Adit, 35 ft long with winze and 15 ft of lower level drifting, a 25-ft-long trench, and a pit. Workings were cut on fault zone in diabase, and on pegmatite. Iron- and manganese-oxide coatings.	Fig. 12; table 2.	Six chip samples taken, all contained gold from 22 to 778 ppb, averaging 224 ppb. Two samples of a nearby rhyolite dike outcrop contained 9 and 16 ppb gold.
155-173	Evelyn Lode Sec. 18 and W. center sec. 17, T. 13 N., R. 16 W.	Several trenches, pits, and opencuts cut on altered basalt and fault zones in basalt. Copper-carbonate and -oxide minerals, minor galena, and iron oxide. Perlite crops out in rhyolitic tuff.	Fig. 13; table 3.	Thirteen chip, two select, two grab, and one panned-concentrate sample taken. Seven contained 6-25 ppb gold, 12 contained 7-654 ppm silver, and several contained elevated concentrations of barium, copper, and lead. One perlite sample expanded uniformly and could be used to make some expanded perlite end-products, but generally would not compete favorably with other commercially available ores.
174-179	Pecos SE. 1/4 sec. 4, T. 12 N., R. 16 W.	Several prospect pits cut in highly fractured gneiss. Chrysocolla, malachite, and iron oxide along fractures; minor quartz veinlets.	Table 2	Five chip and one select sample taken, all contained gold from 13 to 99 ppb, silver from 6 to 45 ppm, and elevated barium and copper concentrations.
180-181	* R SE. 1/4 sec. 11, T. 12 N., R. 16 W.	Pit and opencut in highly fractured, silicified and sericitized granite. Vuggy quartz, barite, and minor chrysocolla. Surface evidence of past drilling.	Table 2	One chip and one select sample contained respective concentrations of: gold, 160 and 713 ppb; silver, 15 and 84 ppm; and elevated concentrations of barium, mercury, and lead.

Table 1.--Summary of mines, prospects, and mineral occurrences in and near the Mohave Wash Wilderness Study Area--Continued

Sample no.	Name and location	Description	Text fig. or table no.	Sample and resource data
182-188	Panned concentrate samples (different localities, see plate 1).	Panned-concentrate samples taken from drainages to evaluate placer claims along study area boundary.	Table 2	Two samples from east side and two from the west side contained detectable gold (9-35 ppb).
None	Manitowoc Mine SW. 1/4 sec. 16, E. center sec. 17, T. 13 N., R. 18 W.	Numerous inaccessible shafts. Dump material suggests several hundreds to thousands of feet of workings probably cut on mineralized veins in fractured granodiorite. (See Light and McDonnell, 1983.)	None	Analytical results presented by Light and Mc Donnell (1983) show silver and gold concentrations as high as 2.2 oz/st and 0.462 oz/st, respectively, and minor lead and zinc.
None	El Campo Mine SE. 1/4 sec. 8, T. 13 N., R. 18 W.	Tunnel, 85 ft long, cut on contact between a pebble conglomerate and granodiorite in paleochannel. Adit, 10 ft long, cut along a fault in diorite. (See Light and McDonnell, 1983.)	None	Analytical results presented by Light and Mc Donnell (1983) show one sample with 0.89 oz/st gold.

Table 2.-- Analytical data for samples not shown in figures 4-13 and table 3.
[Abbreviations and detection limits: gold - Au, 5 ppb; silver - Ag, 5 ppm; barium - Ba, 100 ppm; copper - Cu, 1 ppm; iron - Fe, 0.5 %; mercury - Hg, 5 ppb; lead - Pb, 5 ppm. <, less than; >, greater than; strike and dip -(N. 40° E., 82° SE.); length by width by depth - 6 x 6 x 6 ft.]

Sample			Assay data							
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
					Surface prospects in Golden Slipper area					
59	Chip	2.8	11	---	---	13	0.5	10	14	Fractured quartz vein; iron and manganese oxide along fractures, and sparse pyrite.
60	do.	3.2	10,600 (0.363)1/	8 (3.6)2/	160	2	---	15	26	Do.
61	do.	2.9	110	---	310	176	1.4	25	38	Do.
62	do.	3.4	12	---	170	7	.7	5	85	Do.
					Paloma prospect area					
63	do.	.8	1,100 (.041)1/	---	530	35	2.0	---	6	Pit, 6 x 6 x 6 ft; fractured quartz vein (N. 50° W., 75° NE.); iron oxide along fractures.
64	Select	xx	4,470 (.165)1/	---	150	4,928	1.4	5	11	Stockpile; quartz vein material; minor malachite, chrysocolla, and hematite.
65	Pan con	xx	---	---	600	22	42.0	5	21	Panned concentrate of sediment in drainage at Paloma prospect.
66	Chip	1.9	---	---	1,700	18	6.7	10	18	Adit, 20 ft long; contact between gravel and granite gneiss bedrock; no mineralized zone noted.
67	do.	Random	6	---	---	17	.6	15	28	Outcrop, random chips of quartz pod; no mineralized zone noted.
					SA area					
68	do.	.6	2,360 (.148)1/	---	---	133	1.0	15	1,114	Opencut, 20 ft long; quartz vein (S. 85° E., 65° SW.) between gneiss and diabase dike; hematite after pyrite, galena, and sparse chrysocolla.
69	do.	.8	29	---	---	21	---	---	35	Outcrop along strike of quartz vein; iron oxide along fractures.
70	Select	xx	8,390	11	---	1,635	1.7	300	>10,000	High grade of dumps; quartz vein material; galena, chrysocolla, and minor hematite.
					Surface prospects Rincon #1 claim area					
71	Chip	3.1	18	---	170	19	.7	15	126	Massive quartz vein; no mineralized zones noted.
72	do.	1.8	91	---	---	8,314	1.5	30	51	Massive quartz vein; chrysocolla and chalcopyrite.
73	Select	xx	2,260 (.078)1/	10	120	>20,000	7.0	40	207	High grade of quartz vein; chrysocolla, chalcopyrite, and brochantite(?).
74	Chip	.6	2,150 (.090)1/	---	130	295	1.8	20	101	Quartz vein in contact between gneiss and diabase; minor hematite.
75	do.	1.0	---	---	---	57	---	15	12	Do.

See footnotes at end of table.

Table 2.--Analytical data for samples not shown in figures 4-13 and table 3--Continued

Sample No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
						Misc. prospects in Mohave area				
94	Chip	0.8	9	---	26,500	57	0.5	330	220	Trench, 15 x 3 x 2 ft; fault contact (N. 20° W., 55° NE.) between gneiss and mafic dike; barite.
95	do.	.7	20	---	1,100	>20,000	3.4	40	186	Trench, 19 x 4 x 2 ft; quartz fissure vein (N. 60° W., 40° NE.); drusy quartz, chrysocolla, fluorite(?), and hematite.
96	Select	xx	120	16	400	>20,000	12.0	160	880	High grade of quartz vein; chrysocolla, chalcocite(?), and hematite.
97	Chip	1.6	11	---	440	7,500	1.6	35	26	Opencut 13 x 5 ft; fault zone (N. 60° W., 55° NE.) in gneiss; chrysocolla, fluorite (?), and hematite.
98	Pan con	xx	---	---	1,400	20	32.0	10	50	Panned concentrate of sediment down drainage from samples 86-93.
						WA-1 claim area				
99	Select	xx	5,570 (0.189)1/	30	360 (24)2/	620	1.2	240	>10,000	Trench, 10 x 2 x 1 ft; fractured, vuggy quartz vein from dump; galena, minor chrysocolla and iron oxide.
100	Chip	.3	1,330 (.061)1/	---	---	240	.5	45	690	Pit, 10 x 7 x 4 ft; quartz vein (N. 86° E., vertical) between gneiss and andesite dike; minor chalcopyrite, chrysocolla, and galena.
101	Select	xx	2,530 (.017)1/	56	190 (48)2/	310	2.5	1,950	>10,000	Trench, 15 x 3 x 2 ft; quartz vein from dump; galena and iron oxide.
102	do.	xx	6,130 (.134)1/	78 (40.1)2/	310	6,127	1.9	20	1,126	Trench, 17 x 7 x 6 ft; quartz vein from dump; visible gold, azurite, chrysocolla, minor galena, and iron oxide.
103	Chip	.7	3,660 (.225)1/	36 (34.2)2/	790	2,025	4.5	3,400	>10,000	Pit, 12 x 4 x 5 ft; fault (N. 80° W., 80° SW.) in gneiss, hydrothermally altered; vuggy quartz, wulfenite, chrysocolla, and abundant limonite.
104	Pan con	xx	---	---	3,300	26	42.0	5	42	Panned concentrate of sediment from down drainage from trenches and pits.
						H&L area				
105	Chip	1.5	6	---	210	1	---	. 5	11	Bulldozer cut, 50 x 10 ft; weathered pegmatite and quartz vein; no mineralized zone noted.
106	do.	4.0	1,670 (.045)1/	---	440 (1.2)2/	495	1.9	10	75	Opencut, 80 ft long; fractured massive quartz pod; minor chrysocolla and abundant iron-oxide coating.
107	do.	4.3	87	--- (.6)2/	610	175	1.8	5	55	Do.
108	do.	4.9	739 (.019)1/	12	190 (4.9)2/	21	1.1	5	27	Do.
109	do.	2.0	801 (.031)1/	---	1,300 (1.4)2/	800	3.1	10	29	Do.
110	Select	xx	4,310 (.126)1/	6	350 (1.6)2/	10,500	2.7	15	65	High grade of quartz vein material from dump near opencut.

See footnotes at end of table.

Table 2.--Analytical data for samples not shown in figures 4-13 and table 3--Continued

Sample			Assay data							
No.	Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
					H&L area--Continued					
111	Chip	3.8	30	---	1,700	58	4.3	15	12	Opencut, 15 x 6 ft; fault (N. 23° E., 26° SE.) cutting gneiss and quartz vein; no mineralized zones noted.
112	Select	xx	5,820 (0.168)1/	19	420 (10)2/	13	2.4	250	39	Outcrop; grab of broken quartz vein material that appears blasted from outcrop; vuggy quartz and limonite.
113	Chip	2.5	350 (.010)1/	---	160	10	1.7	30	7	Pit, 4 x 3 x 3 ft, in a 100 x 25 ft quartz outcrop; abundant iron oxide.
114	Select	xx	1,040 (.026)1/	---	110	10,500	2.5	40	64	High grade from dump of copper mineralized quartz vein material.
					Rad #2 claim area					
115	Chip	.8	360	---	220	116	1.2	5	290	Opencut, 10 ft long with 5-ft-deep doghole; fractured quartz vein (N. 76° E., 75° SE.); iron oxide along fractures.
116	do.	.8	64	---	120	57	.7	5	78	Pit, 10 x 4 x 3 ft; fractured quartz vein (S. 88° E., 88° NE.); iron oxide along fractures.
117	Select	xx	5,560 (.266)1/	---	1,100	679	.8	10	240	High grade from pit dump; vuggy quartz vein, visible gold, iron oxide along fractures, minor chrysocolla.
118	Chip	1.3	52	---	140	15	---	5	60	Pit, 4 x 3 x 1 ft; broken quartz vein (N. 80° E., nearly vertical) between diabase and gneiss; vuggy, iron oxide along fractures.
119	Select	xx	430	---	---	11	.7	10	59	Pit, 6 x 3 x 3 ft; quartz vein poorly exposed in pit, grab sample of vein from dump; vuggy, iron oxide along fractures.
120	Chip	2.0	3,260 (.120)1/	9	2,500	440	12.0	20	900	Trench, 20 x 4 x 8 ft; fault zone (S. 80° E., 74° SW.) between gneiss and andesite; specular hematite and magnetite(?).
121	do.	1.3	300	7	1,200	162	11.0	45	225	Trench, 8 x 3 x 2 ft; fault zone (Due W., 74° S.) in andesite; specular hematite and minor calcite.
122	do.	1.7	8	---	---	29	1.4	35	328	Pit, 6 x 6 x 2 ft; quartz vein (Due W., 65° S.); specular hematite and hematite after pyrite.
123	Grab	xx	33	---	130	35	4.0	35	395	Random sample from pit dump; specular hematite.
					Manitowoc Mine area					
147	Chip	4.3	16	---	650	3	1.0	30	---	Outcrop; weathered, fractured rhyolitic dike; iron and manganese oxide along fractures.
148	do.	3.2	9	---	790	4	.7	30	66	Do.

See footnotes at end of table.

Table 2.--Analytical data for samples not shown in figures 4-13 and table 3--Continued

Sample No.	Sample Type	Length (ft)	Au (ppb)	Ag (ppm)	Ba (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	Pb (ppm)	Remarks
						Pecos area				
174	Chip	3.5	28	14	1,100	1,600	2.8	35	28	Pit, 6 x 5 x 5 ft; fractures (N. 74° W., 83° NE.) in gneiss; chrysocolla, malachite, and quartz veinlets.
175	do.	1.7	17	6	610	3,600	3.1	25	11	Pit, 7 x 5 x 5 ft; fractures (N. 50° E., 15°-45° SE.) in gneiss; chrysocolla along fractures.
176	Select	xx	99	9	510	19,000	4.2	25	9	Stockpile next to pit; chrysocolla and iron oxide in gneiss.
177	Chip	1.5	13	9	480	3,700	2.6	35	23	Pit, 6 x 5 x 4 ft; fractures (N. 25° E., 40° SE.) in gneiss, chrysocolla and iron oxide along fractures, hematite after pyrite.
178	do.	Random	18	8	1,100	3,000	1.1	25	21	Pit, 4 x 4 x 4 ft; random chips of highly fractured gneiss; chrysocolla along fractures, and minor disseminated pyrite.
179	do.	4.6	81	45	720	8,800	5.5	50	38	Pit, 5 x 5 x 5 ft; highly fractured gneiss; quartz stringers, chrysocolla, malachite, and iron oxide.
						R claims				
180	do.	3.6	160	15	29,000	43	1.6	550	1,050	Pit, 5 x 5 x 5 ft; fault zone (N. 48° W., vertical) in silicified and sericitized granite; vuggy and drusy quartz, adularia, and barite.
181	Select	xx	713	84	>30,000	795	.9	2,350	3,400	Opencut, 6 x 6 ft; highly fractured and silicified granite from around prospect; quartz veinlets, barite, minor chrysocolla, and a sinter-like material.
						Panned-concentrate samples				
182	Pan con	xx	---	---	760	8	3.5	20	20	Panned concentrate of sediment from eastern flank of study area.
183	do.	xx	35	---	720	50	8.0	30	74	Do.
184	do.	xx	9	---	990	41	6.3	20	96	Do.
185	do.	xx	---	---	900	44	12.0	5	19	Do.
186	do.	xx	---	---	470	19	51.2	20	36	Do.
187	do.	xx	11	---	660	28	18.0	30	45	Panned concentrate of sediment from western flank of study area.
188	do.	xx	<12	---	310	29	43.0	10	30	Do.

1/ Reanalysis by fire assay, result in oz/st.
2/ Reanalysis by D.C. plasma emission spectroscopy, result in ppm.

Table 3.--Laboratory furnace test results of perlite sample no. 173.

[°F, degree Fahrenheit; g, gram; cm^3, cubic centimeter; kg/m^3, kilogram per cubic meter.]

Preheat (°F)	Gross mass (g)	Net mass (g)	Volume (cm^3)	Calculated density (kg/m^3)	Comments
0	141.1	8.6	62	139	Much drop-out, poor but uniform expansion.
300	143.2	10.7	71	151	Much drop-out, little collected.
600	141.2	8.7	98	89	50% well expanded, 50% poorly.

Sample expanded uniformly (either well or poorly) and could be used to make some expanded perlite end-products but generally would not compete favorably with other commercially available ores.

DEPARTMENT OF THE INTERIOR
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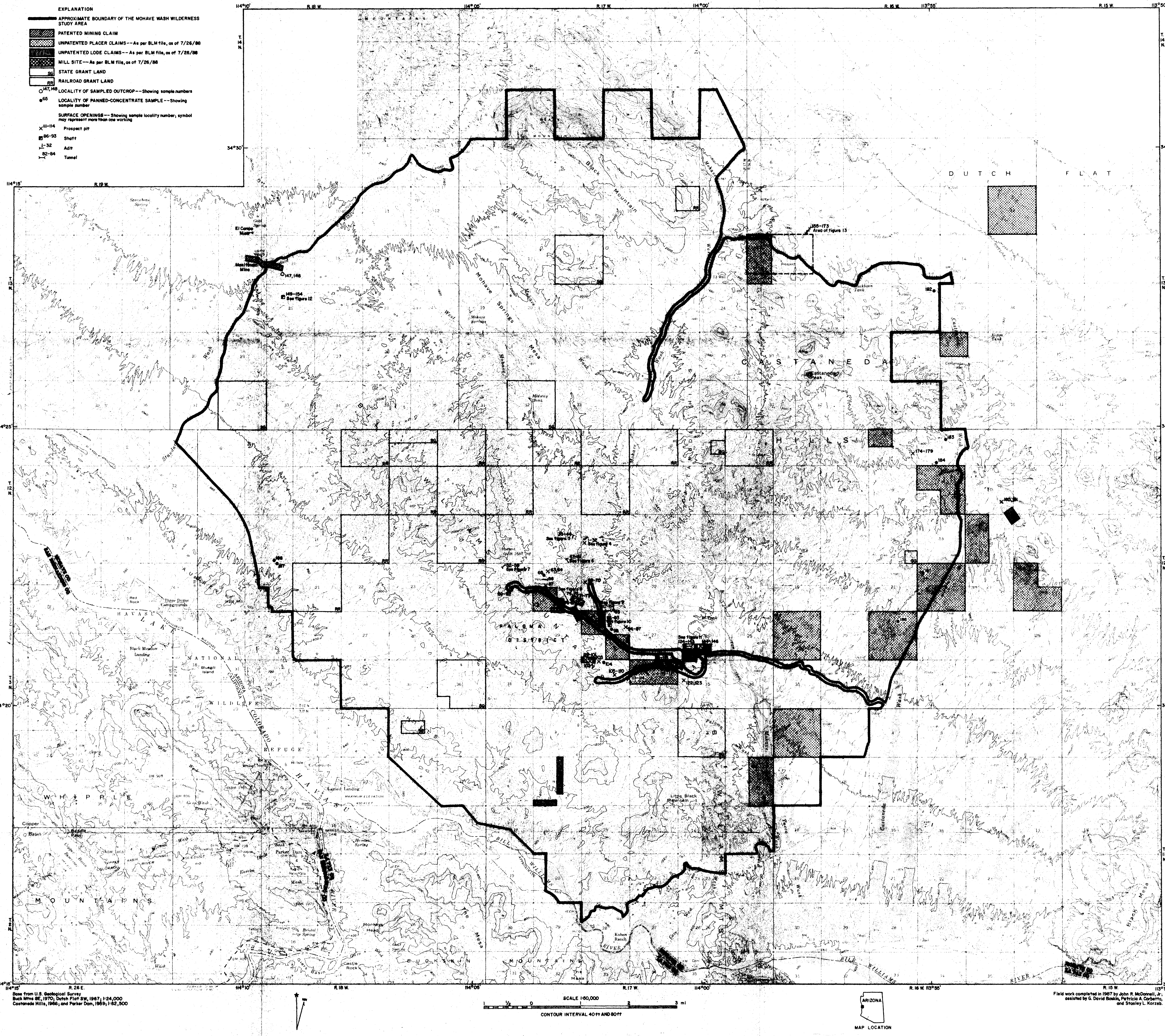
PLATE 1



MINE AND PROSPECT MAP OF THE MOHAVE WASH WILDERNESS STUDY AREA, MOHAVE COUNTY, ARIZONA

BY

JOHN R. McDONNELL, JR., U.S. BUREAU OF MINES

1989